



ORIGINAL ARTICLE /ARTÍCULO ORIGINAL

CHECKLIST OF PLATYHELMINTH PARASITES OF HUMANS DEPOSITED IN HELMINTHOLOGICAL COLLECTION OF THE OSWALDO CRUZ INSTITUTE, BRAZIL

LISTA DE VERIFICACIÓN DE LOS PLATELMINTOS PARÁSITOS DE HUMANOS DEPOSITADOS EN LA COLECCIÓN HELMINTOLÓGICA DEL INSTITUTO OSWALDO CRUZ, BRASIL

Magda Sanches^{1,3}; Marcelo Knoff^{1*}; Delir Corrêa Gomes¹ & Beatriz Brener²

¹Laboratório de Helminhos Parasitos de Vertebrados, Instituto Oswaldo Cruz, Fiocruz, Rio de Janeiro, RJ, Brazil.

²Departamento de Microbiologia e Parasitologia, Instituto Biomédico, Universidade Federal Fluminense, Niterói, RJ, Brazil.

³Pós-Graduação em Microbiologia e Parasitologia Aplicadas, Universidade Federal Fluminense, Niterói, RJ, Brazil.

*Correspondence to author/ Autor para correspondencia: Marcelo Knoff

Laboratório de Helminhos Parasitos de Vertebrados, Instituto Oswaldo Cruz, Fiocruz, Av. Brasil, 4365, Manguinhos, CEP 21045-900. Rio de Janeiro, RJ, Brazil. Phone: +55(21) 2562-1462, Fax: +55(21) 2562-1511

E-mail/correo eletrônico: knoffm@ioc.fiocruz.br

Neotropical Helminthology, 2016, 10(1), ene-jun: 73-84.

ABSTRACT

The Helminthological Collection of the Oswaldo Cruz Institute (CHIOC), Rio de Janeiro, Brazil is the largest collection in Latin America in number of specimens and is among the leading collections of world. It contains representative specimens from hosts of various biomes of the Brazilian and other countries' biodiversity. There are several types of helminths deposited, including parasites of medical and veterinary importance. The samples are stored as wet material and/or as whole mounts. To obtain the knowledge of the platyhelminths parasitizing man deposited in CHIOC we did a survey of samples in the computerized database and its catalog cards. A total of 113 catalog cards with 236 samples deposited in the CHIOC were analyzed. Listed records included the deposit number, date of collection, geographical distribution, site of infection and the developmental stage. From 113 records cataloged, Trematoda has 27 records with six species, and the highest numbers of deposits are related to Cestoda with 86 records with 12 species. The most frequent species of trematodes was adults of *Schistosoma mansoni* Sambon, 1907 mostly from the State of Minas Gerais, Brazil. *Taenia saginata* Goeze, 1782 was the most frequent species of cestode mostly from the State of Rio de Janeiro, Brazil. Of the flatworms, the first deposit was specimens of *T. saginata* adults, CHIOC 1 without information of date of collection, deposited in 1913, and the last deposit was of an adult *Diphyllobothrium latum* (Linnaeus, 1758), CHIOC 37003, collected on 21 April 2005.

Keywords: Cestoda – CHIOC – Digenea – human – Platyhelminthes

RESUMEN

La Colección Helminológica del Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, Brasil, es la colección más grande de América Latina en número de especímenes y es una de las principales colecciones del mundo. Contiene especies representativas de diversos biomas, testimonios de la biodiversidad brasileña y de otros países. Existen varios tipos de helmintos depositados en la misma, incluidos los parásitos de importancia médica y veterinaria. Las muestras están depositadas como material líquido o montaje final. Para obtener el conocimiento de los platelmintos que parasitan al hombre depositados en CHIOC, se realizó un estudio de sus muestras en su base de datos informatizada y sus fichas de catálogo. Se analizaron un total de 113 fichas de catálogo con 236 muestras depositadas en la CHIOC. Una lista de estos helmintos se generó a partir del número de depósito de las muestras analizadas, que fueron incluidas con información sobre la fecha de recogida, distribución geográfica, el sitio de infección y el estado ontogenético. De los 113 registros catalogados en la CHIOC, sobre platelmintos parásitos de los seres humanos, Trematoda tiene 27 registros con 6 especies, y el mayor número de depósitos están relacionados con Cestoda, con 86 registros con 12 especies. Entre los trematodos la especie con mayor número de depósitos es *Schistosoma mansoni* Sambon, 1907 en fase adulta de la circulación sanguínea y la mayoría de ellos son del Estado de Minas Gerais, Brasil. Entre los cestodos la especie con mayor número de depósitos es *Taenia saginata* Goeze, 1782 adulta del intestino y la mayoría de ellos son del Estado de Rio de Janeiro, Brasil. En las muestras de los platelmintos el primer depósito fue *T. saginata* adulto, CHIOC 1, sin información de fecha de colecta, depositada en 1913, y el último depósito fue un *Diphyllobothrium latum* (Linnaeus, 1758) adulto, CHIOC 37003, colectado el 21 de abril de 2005.

Palabras clave: Cestoda - CHIOC - Digenea - humano - Platelminotos

INTRODUCTION

In Latin America there are about 10 helminthological collections internationally recognized, and the Helminthological Collection of the Oswaldo Cruz Institute (CHIOC) is the largest of them in number of specimens deposited and it is among the leading collections in the world (Knoff *et al.*, 2010; Lamothe-Argumedo *et al.*, 2010).

The CHIOC contains a large biodiversity and has representatives from various biomes from Brazil, such as: Amazon, Atlantic Forest, Cerrado, Caatinga, Pantanal, Pampa and continental and marine waters, there is also helminths of the five continents. It has several types of parasites deposited in its collection,

including those of medical and veterinary importance (Noronha *et al.*, 2009).

The survey of the CHIOC include about 38,000 samples of helminths (what does not indicate the number of specimens, since they can vary from one to hundreds of per sample) (Brasil, 2014), among these, species that cause zoonoses and some of them known as neglected tropical diseases. Neglected helminthiasis affect more often the population living in precarious hygiene conditions, and children are the most affected individuals (Conteh *et al.*, 2010).

This study presents the effort to list all the Platyhelminths species causing helminthiasis collected from human deposited in CHIOC, Rio de Janeiro, Brazil, in order to disseminate

their information and thus to make them available for taxonomic, systematic, morphological, biological, ecological, epidemiological studies and geographic distribution contributing to of these infections.

MATERIAL AND METHODS

This work was developed from a survey of Platyhelminthes specimens samples deposited in the Helminthological Collection of the Oswaldo Cruz Institute (CHIOC), Fiocruz, Rio de Janeiro, Brazil. The material studied is preserved as a wet material and/or whole mounts and have been stored since the beginning of the 20th century.

The wet materials are preserved in ethanol 70° GL, ethanol 70° GL 5% glicerinated and acetic formaldehyde in glass flasks. The whole mounts are preserved in permanent mean, mounted between slide and coverslip in Canada balsam. The samples are stored in modern steel closets with smoothly sliding doors.

To generate the checklist a survey in the records of the CHIOC database was made, and a total of 113 catalog cards and 236 samples were analyzed. The information of samples was checked and cited in the following sequence, whenever available, related the CHIOC number with the date of collect, geographical distribution, site of infection and ontogenetic stage.

The taxonomic classification follows Travassos *et al.* (1969), Yamaguti (1971), Brooks & McLennan (1993), Gibson *et al.* (2002), Jones *et al.* (2005) and Bray *et al.* (2008) for Digenea, and Verster (1969), Schmidt (1986), Khalil *et al.* (1994) and Kuchta *et al.* (2008) for Cestoda, and the terminology of larval cestodes follows Chervy (2002).

Ethics statement, the material used in this study is from the deposit of researchers, who in the act of deposits in the CHIOC were in accordance with current rules.

RESULTS

From 113 records cataloged in the CHIOC about the Platyhelminthes parasitizing humans Trematoda has 27 records with six species, and the highest number of deposits are related to Cestoda with 86 records with 12 species. On the trematodes the species with highest number of deposits are adults of *Schistosoma mansoni* of blood circulation and the majority of them are from the State of Minas Gerais, Brazil. Among the cestodes the species with highest number of deposits are adults of *Taenia saginata* of intestine and the majority of them are from the State of Rio de Janeiro, Brazil. On the samples of human flatworms, the first deposit was the *T. saginata* adult, CHIOC 1 without information of date of collect, deposited in 1913, when it had its initial organization, and the last deposit was a *Diphyllobothrium latum* adult, CHIOC 37003, collected on 21 April 2005.

The checklist of these species is showed below.

Phylum Platyhelminthes Gegenbaur, 1859
 Class Trematoda Rudolphi, 1808
 Subclass Digenea Carus, 1863
 Order Echinostomatiformes La Rue, 1957
 Superfamily Echinostomatoidea Looss, 1899
 Family Fasciolidae Railliet, 1895
 Genus *Fasciola* Linnaeus, 1758
Fasciola sp., CHIOC: 1360, September, 1916,
 Rio de Janeiro, RJ, Brazil, eggs.

Order Streigiformes La Rue, 1926
 Superfamily Schistosomatoidea Stiles & Hassall, 1898
 Family Schistosomatidae Poche, 1907
 Genus *Schistosoma* Weiland, 1858
Schistosoma haematobium (Bilharz, 1852),

CHIOC: 778 a-d, eggs, CHIOC: 779, eggs, CHIOC: 7162, September 9, 1929, Paris, France, urinary vesicle, eggs; *Schistosoma japonicum* (Katsurada, 1904), CHIOC: 15403, Shanghai, China, adult; *Schistosoma mansoni* Sambon, 1907, CHIOC: 154, July 26, 1912, Goiás, Brazil, faeces, eggs, CHIOC: 780, Bahia, Brazil, eggs; CHIOC: 781, August 26, 1912, Goiás, Brazil, faeces, eggs; CHIOC: 935, Bahia, Brazil, adult; CHIOC: 1344, November, 1916, Rio de Janeiro, RJ, Brazil, faeces, eggs; CHIOC: 2399, July 4, 1916, Rio de Janeiro, RJ, Brazil, Faeces; CHIOC: 2400, June 17, 1916, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 4289, Bahia, Brazil, portal system, adult; CHIOC: 4512, December, 1922, Rio de Janeiro, RJ, Brazil, rectum, eggs; CHIOC: 6374, Bahia Brazil, adult; CHIOC: 7163, September, 1929, Egypt, intestinal polyps, eggs; CHIOC: 13610, August, 1936, Recife, Pernambuco, Brazil, adult; CHIOC: 25775, July 16, 1916, Aracajú, Sergipe, Brazil, faeces, eggs, CHIOC: 31158a-z, 1974, Governador Valadares, Minas Gerais, Brazil, blood circulation, adults, CHIOC: 31159a-o, 1974, Governador Valadares, Minas Gerais, Brazil, blood circulation, adults, CHIOC: 31160a-r, 1974, Governador Valadares, Minas Gerais, Brazil, blood circulation, adults, CHIOC 31161a-z and aa-ae, 1974, Governador Valadares, Minas Gerais, Brazil, blood circulation, adults, CHIOC 31162a-b, 1974, Governador Valadares, Minas Gerais, Brazil, blood circulation, adults.

Order Opisthorchiiformes La Rue, 1957

Family Opisthorchiidae Braun, 1901

Genus *Clonorchis* Looss, 1907

Clonorchis sinensis (Cobbold, 1875), CHIOC: 1978, adult; CHIOC: 4313, Hanoi, Vietnam, liver, adult; CHIOC: 5717, March, 1927, Hanoi, Vietnam, liver, adult.

Opistorchis Blanchard, 1895

Opistorchis felinus (Rivolta, 1884), CHIOC: 4515, 1914.

Class Cestoda van Beneden, 1849

Order Diphyllbothriidea Kuchta, Scholz, Brabec & Bray, 2008

Family Diphyllbothriidae Lühe, 1910

Genus *Adenocephalus* Nybelin, 1931

Adenocephalus pacificus Nybelin, 1931 (syn. *Diphyllbothrium pacificum*) CHIOC: 19820, May, 1961, Chile, adult, CHIOC: 28043a-c, May, 1961, Chile, adult.

Genus *Diphyllbothrium* Cobbold, 1858

Diphyllbothrium latum (Linnaeus, 1758), CHIOC: 13997, 1941, Montevideo, Uruguay, adult, CHIOC: 30161 a-b, August, 1966, Cordoba, Argentina, intestine, adult, CHIOC: 30162 a-c, August, 1966, Cordoba, Argentina, intestine, adult, CHIOC: 30196, August, 1966, Cordoba, Argentina, intestine, adult, CHIOC: 35582, August, 2004, Rio de Janeiro, RJ, Brazil, eggs, CHIOC: 37003 a-e, April 21, 2005, Rio de Janeiro, RJ, Brazil, intestine, adult.

Order Cyclophyllidea Braun, 1900

Family Taeniidae Ludwig, 1886

Genus *Taenia* Linnaeus, 1758

Taenia saginata Goeze, 1782, CHIOC: 1, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 179: Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 212, November, 1912, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 213, intestine, adult, CHIOC: 220, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 221, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 358, July, 1914, Rio de Janeiro, RJ, Brazil, adult, CHIOC: 601, adult, CHIOC: 602, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 603, intestine, adult, CHIOC: 604, Rio de Janeiro, RJ, Brazil, adult, CHIOC: 605, November 5, 1912, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 606, October 9, 1908, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 607, 1907, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 608, 1913, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 609, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 610, Rio de Janeiro, RJ, Brazil, adult, CHIOC:

611, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 612, Rio de Janeiro, RJ, Brazil, adult, CHIOC: 613, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 614, Rio de Janeiro, RJ, Brazil, adult, CHIOC: 615, October 19, 1907, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 616, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 871 a-c, February, 1915, Rio de Janeiro, RJ, Brazil, faeces, adult, CHIOC: 872, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 873, 1912, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 2751, November 27, 1920, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 2752, November 27, 1920, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 2753, November 27, 1920, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 2754, November 27, 1920, Rio de Janeiro, RJ, Brazil, faeces, adult, CHIOC: 2755, November 27, 1920, Rio de Janeiro, RJ, Brazil, faeces, adult, CHIOC: 4567, October 20, 1922, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 4568, 1922, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 8184, December, 1938, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 10584, December, 1938, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 17435, Brazil, adult, CHIOC: 17436, Brazil, adult, CHIOC: 24467, June 4, 1956, Brazil, intestine, adult; *Taenia solium* Linnaeus, 1758, CHIOC: 88, October, 1913, Rio de Janeiro, RJ, Brazil, muscle, cysticercus, CHIOC: 4405, cysticercus, CHIOC: 5054, Minas Gerais, Brazil, faeces, adult, CHIOC: 5768, 1927, Rio de Janeiro, RJ, Brazil, intestine, adult, CHIOC: 6260, April 06, 1928, São Paulo, Brazil, small intestine, adult, CHIOC: 10589, 1937, São Paulo, Brazil, eye, cysticercus, CHIOC: 14038, 1942, Rio de Janeiro, RJ, Brazil, muscle, cysticercus, CHIOC: 14039, 1942, Rio de Janeiro, RJ, Brazil, muscle, cysticercus, CHIOC: 19538 (1-19), 1951, Salvador, Bahia, Brazil, small intestine, adult; *Taenia* sp., CHIOC: 12435, February, 1942, Rio de Janeiro, RJ, Brazil, cecal appendix, adult, CHIOC: 23365, 1956, Rio de Janeiro, RJ, Brazil, intestine, adult.

Genus *Echinococcus* Rudolphi, 1801

Echinococcus granulosus (Batsch, 1786), CHIOC: 181, September 9, 1906, Rio de Janeiro, RJ, Brazil, lung, hydatid, CHIOC: 319, February, 1909, Rio de Janeiro, RJ, Brazil, Spiegel's lobe, hydatid, CHIOC: 325, hydatid, CHIOC: 7414, May, 1930, Rio de Janeiro, RJ, Brazil, liver, hydatid, CHIOC: 9192, February, 1909, Rio de Janeiro, RJ, Brazil, Spingel's lobe, hydatid, CHIOC: 9217, Rio de Janeiro, RJ, Brazil, hydatid, CHIOC: 12441, Rio de Janeiro, RJ, Brazil, liver, hydatid; *Echinococcus vogeli* Rausch & Bernstein, 1972, CHIOC: 34336, 1998, Maranhão, Brazil, liver, hydatid, CHIOC: 35412, Acre, Brazil, liver, hydatid, CHIOC: 36576, Acre, Brazil, liver, hydatid; *Echinococcus* sp., CHIOC: 1812, 1919, Rio de Janeiro, RJ, Brazil, hydatid.

Family Hymenolepididae Ariola, 1899

Genus *Hymenolepis* Weinland, 1858

Hymenolepis diminuta (Rudolphi, 1819), CHIOC: 1000, August, 1916, Rio de Janeiro, RJ, Brazil, intestine, eggs, CHIOC: 1688, São Paulo, Brazil, intestine, eggs, CHIOC: 1689, São Paulo, Brazil, faeces, eggs, CHIOC: 1690, 1918, São Paulo, faeces, eggs, CHIOC: 1691, São Paulo, Brazil, faeces, eggs, CHIOC: 1692, São Paulo, Brazil, faeces, eggs, CHIOC: 10794 a-d, 1939, Rio de Janeiro, RJ, Brazil, faeces, adult, CHIOC: 18027, 1939, Rio de Janeiro, RJ, Brazil, adult, CHIOC: 19927, May 15, 1952, Rio de Janeiro, RJ, Brazil, faeces, adult; *Hymenolepis* sp., CHIOC: 2946, May 12, 1921, Rio de Janeiro, RJ, Brazil, faeces, adult, CHIOC: 2947, May 12, 1921, Rio de Janeiro, RJ, Brazil, faeces, adult, CHIOC: 2948, May 12, 1921, Rio de Janeiro, RJ, Brazil, faeces, adult, CHIOC: 2949, May 12, 1921, Rio de Janeiro, RJ, Brazil, faeces, adult, CHIOC: 2950, May 12, 1921, Rio de Janeiro, RJ, Brazil, faeces, adult.

Genus *Rodentolepis* Spasskii, 1954

Rodentolepis nana (Siebold, 1852), CHIOC: 2719 a-h, June 27, 1921, Rio de Janeiro, RJ,

Brazil, faeces, eggs, CHIOC: 2776, June, 1921, Rio de Janeiro, RJ, Brazil, faeces, adult, CHIOC: 4668, 1923, small intestine, eggs, CHIOC: 4784, December 23, 1924, faeces, eggs.

Family Davaineidae Braun, 1900
Genus *Raillietina* Fuhrmann, 1920
Raillietina sp., CHIOC: 27270, Ecuador, adult.

Family Dipylidiidae Stiles, 1896
Genus *Dipylidium* Leuckart, 1863
Dipylidium caninum (Linnaeus, 1758), CHIOC: 5523, 1925, Rio de Janeiro, RJ, Brazil, faeces, adult.

DISCUSSION

The Helminthological Collection of the Oswaldo Cruz Institute is characterized by containing deposits from Brazil and several countries. Currently it has been observing a gradual increase in deposits, due to the need of researchers to demonstrate the records in the publications of the samples studied, this is also occurring with deposits related to helminths from humans, although in a smaller proportion. In CHIOC there are more deposited samples from animals than human samples, being evidenced by the surveying of the present study (Noronha *et al.*, 2009; Knoff *et al.*, 2010; Brasil, 2014).

Fasciola hepatica, species that causes fascioliasis, zoonosis that affects the liver, with their young forms crossing the liver parenchyma, and adult forms in the bile ducts, of several species of wild and domestic animals (Pile *et al.*, 2001; Santos, 2014). Recently human cases have been reported in Bali and Iran (Ashrafi *et al.*, 2015; Figtree *et al.*, 2015). The highest number of human cases reported in Latin America were reported in Bolivia and Peru (Gulsen *et al.*, 2002). In Brazil, there are confirmed cases in the states

of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, Rio de Janeiro and Minas Gerais (Gomes *et al.*, 2002; Santos, 2014). In the present study the sample of *F. hepatica* is from the State of Rio de Janeiro, Brazil.

Schistosoma mansoni, which causes mansonic schistosomiasis, is coextensive with *S. haematobium*, which causes urinary schistosomiasis in large areas (Mott & Cline, 1980; Jordan *et al.*, 1993). *Schistosoma haematobium* is endemic in 53 countries in Africa and the Middle East, the infection caused by *S. japonicum* has been recorded for China, Japan and Philippines, and *S. mansoni* was reported in 52 countries in Africa, the Mediterranean, the Caribbean and parts of South America (Acha & Szyfres, 2003). Recently were reported human cases of *S. haematobium* and *S. mansoni* in Yemen and *S. mansoni* Brazil (state of Bahia) (Sady *et al.*, 2015; Blanton *et al.*, 2015). About of the samples of *S. haematobium* in CHIOC, two have not record of geographical origin, and the other is from Paris, France, that sample of *S. japonicum* is from China, and those of *S. mansoni* are from Egypt and from several states of Brazil (Pernambuco, Sergipe, Bahia, Goiás, Minas Gerais and Rio de Janeiro).

Clonorchis sinensis, species causing the clonorchiasis, is a parasitic disease of great importance to public health in many countries in Southeast Asia (Acha & Szyfres, 2003; Chelomina *et al.*, 2014). According to Knoff *et al.* (2013) clonorchiasis cases in Brazil have been reported of East Asian immigrants in the city of São Paulo. The samples found in CHIOC, two are from Vietnam and the other has no record of geographical origin.

Ophisthorchis felinus is a trematode parasitizing the bile ducts of humans, cats, dogs and other animals that feed fish, has been found in Russia, Siberia, Kazakhstan, and there are smaller foci in Europe, Korea, India, Japan and Philippines (Acha & Szyfres,

2003). Additionally, opisthorchiasis human cases were reported in Italy (Gómez-Morales *et al.*, 2013). The sample deposited in CHIOC has no record of geographical origin.

Adenocephalus pacificus has been reported in Chile, Peru and Ecuador, is the most important causative agent of human diphyllbothriosis in South America, however cases recently imported to Europe demonstrate the potential for spread of this tapeworm throughout the world as a result of global trade of fresh or chilled marine fish and travel or migration of humans (Acha & Szyfres, 2003; Hernandez-Orts *et al.*, 2015; Kuchta *et al.*, 2015). The samples deposited in the CHIOC are from Chile, and were deposited as *D. latum*.

Diphyllbothrium latum is a wide geographic distribution species found in the temperate zones, between the subarctic and subtropical, particularly lacustrine regions. In South America this helminth has been found parasitizing humans in some countries, including sporadic cases in states of Brazil (Acha & Szyfres, 2003; Knoff *et al.*, 2011, 2012, 2013). The samples deposited in the CHIOC are from Uruguay, Argentina, and from those cases reported of state of Rio de Janeiro, Brazil by Knoff *et al.* (2011).

Taenia solium and *T. saginata* are cosmopolitan species. *Taenia solium* is much more common in developing countries, particularly in Latin America, eastern Europe, northern China, India and eastern Africa. *Taenia saginata* there is a wider distribution, particularly in eastern and western Africa, North and South America and Europe (Acha & Szyfres, 2003). Additionally, human cases of *T. solium* have been reported from Mexico, Poland, Southern Rwanda, Thailand, Hymalaya (Waloch, 2005; Joshi *et al.*, 2012; Rottbeck *et al.*, 2013; Cárdenas *et al.*, 2014; McCleery *et al.*, 2015) and Brazil (states of Ceará and Santa Catarina) (Alves *et al.*, 2011; Pantaleão *et al.*, 2007), and *T.*

saginata from Poland, Italy, Turkey, Egypt, northern Iran (Waloch, 2005; Digerli *et al.*, 2005; Dutto *et al.*, 2009; Omran & Mohammad, 2015; Saravi *et al.*, 2016). The most of samples of *T. saginata* deposited in the CHIOC are from the state of Rio de Janeiro, Brazil, and of *T. solium* are from the states of Bahia, Minas Gerais, Rio de Janeiro and São Paulo, Brazil, and *Taenia* sp. are from state of Rio de Janeiro, Brazil.

Among the species of *Echinococcus*, *E. granulosus* is the most widespread of the species, and they are usually associated with the people involved with management of sheep and goats in several countries of all continents of the world (Acha & Szyfres, 2003). *Echinococcus granulosus* presents high endemicity in the southern South America, Argentina, southern Brazil, Chile, Peru and Uruguai (Acha & Szyfres 2003; Rajender *et al.*, 2015). *Echinococcus vogeli* is present only in South and Central America (Acha & Szyfres, 2003; Soares *et al.*; 2004). Recently, studies of human cases parasitized by *E. vogeli* were reported from the state of Acre, Brazil (Siqueira *et al.*, 2010; Almeida *et al.*, 2013). The samples of *E. granulosus* in CHIOC are from state of Rio de Janeiro, Brazil. The samples of *E. vogeli* deposited in CHIOC are from states of Maranhão and Acre, Brazil, and of *Echinococcus* sp. are from state of Rio de Janeiro, Brazil.

Hymenolepis diminuta is usually uncommon but has been reported from various areas of the world, in man has been reported in India, Korea, Itália, Espanha, Jamaica, USA, Chile, São Tomé and Príncipe, Yugoslavia, Brasil (state of Minas Gerais) (Acha & Szyfres, 2003; Tiwari *et al.*, 2014). The samples in CHIOC of *H. diminuta* are from states of São Paulo and Rio de Janeiro, Brazil, and of *Hymenolepis* sp. are from Rio de Janeiro, Brazil.

Rodentolepis nana (= *Hymenolepis nana*) species causing rodentolepidiasis (known also

as hymenelopidiasis), is the most prevalent human cestodiasis in the world, has been found in Zimbabwe, Egypt, Nigeria, India, Korea, Canada, Cuba, Peru, Chile, Bolivia, Colombia and Brazil (Acha & Szyfres, 2003). Recently, was reported a human case with an extraintestinal infection from Colombia (Muehlenbachs *et al.*, 2015). About the samples deposited in CHIOC, are from state of Rio de Janeiro, Brazil with exception of two that have no record of geographical origin.

The species of the genus *Raillietina* cause the zoonosis raillietiniasis that has been reported in the southeastern Africa, Iran, Japan, Australia, Mauritius, Philippines, Taiwan, Tailand, Turkestan region of Asia, Cuba, Honduras, Guyana and Ecuador (Acha & Szyfres, 2003). The sample in the CHIOC of *Raillietina* sp. is from Ecuador.

Dipylidium caninum, a dog intestinal parasite, represents a zoonotic potential, most infecting children, has been found in several countries, mainly in Europe, USA and Latin America. Metropolitan areas that have high concentrations pets and urban fecal contamination in public areas are at health risks. In Brazil human infections have been reported since 1917 (Lemos & Oliveira, 1985; Acha & Szyfres, 2003; Zanzani *et al.*, 2014). The sample of CHIOC is from the state of Rio de Janeiro, Brazil.

In some older faeces samples and mounted between slide and cover slip, were deteriorated, making it difficult to analyze them.

The Platyhelminthes species collected from human stored in the CHIOC reported in the present checklist can be used to researchers with medical and veterinary concerns, providing subsidies for health surveillance secretaries in planning and on control of intestinal parasites and to control and/or eradicate the zoonoses.

BIBLIOGRAPHIC REFERENCES

- Acha, PN & Szyfres, B. 2003. *Zoonoses and communicable diseases common to man and animals*. 3ed. Pan American Health Organization, Washington, D.C., 395 p.
- Almeida, FB, Corrêa, CL, Siqueira, NG, Carvalho, NVFMS, Rodrigues-Silva, R, Andrade, AFB & Machado-Silva, JR. 2013. *Histopathological findings of an uncommon co-infection: Echinococcus vogeli, HIV, hepatitis C virus, and hepatitis B virus*. International Journal of Infectious Diseases, vol. 17, pp. 925-927.
- Alves, APNN, Nogueira, TNAG, Teixeira, MJ, Costa, FWG & Sousa, FB. 2011. *Tapeworm infection in the tongue*. Revista do Instituto de Medicina Tropical de São Paulo, vol. 53, pp. 299-300.
- Ashrafi, K, Saadat, F, O'Neill, S, Rahmati, B, Tahmasbi, HA, Dalton, JP, Nadim, A, Asadinezhad, M & Rezvani, SM. 2015. *The endemicity of human fascioliasis in Guilan Province, Northern Iran: the baseline for implementation of control strategies*. Iranian Journal of Public Health, vol. 44, pp. 501-511.
- Blanton, RE, Barbosa, LM, Reis EA, Carmo TM, Dos Santos CR, Costa JM, Aminu, PT, Blank, VVA, Reis, RB, Guimarães, IC, Silva, LK & Reis, MG. 2015. *The relative contribution of immigration or local increase for persistence of urban schistosomiasis in Salvador, Brazil*. PLoS Neglected Tropical Diseases vol. 9, e0003521. doi: 10.1371/journal.pntd.0003521.
- Brasil. 2014. Coleção Helmintológica do Instituto Oswaldo Cruz (CHIOC), Fundação Oswaldo Cruz, consultado el 12 de diciembre de 2014, <<http://chioc.fiocruz.br>>
- Bray, RA, Gibson, DI & Jones, A. 2008. *Keys to the Trematoda. Volume 3*. CABI Publishing, Wallingford, 824 p.

- Brooks, DR & McLennan, DA. 1993. *Parascript. Parasites and the Language of Evolution*. Smithsonian Institution Press, Washington DC, 429 p.
- Cárdenas, G, Fragoso, G, Rosetti, M, Uribe-Figueroa, L, Rangel-Escareño, C, Saenz, B, Hernández, M, Sciutto, E & Fleury, A. 2014. *Neurocysticercosis: the effectiveness of the cysticidal treatment could be influenced by the host immunity*. Medical Microbiology and Immunology, vol. 203, pp. 373-381.
- Chelomina, GN, Tatonova, YV, Hung, NM & Ngo, HD. 2014. *Genetic diversity of the Chinese liver fluke Clonorchis sinensis from Russia and Vietnam*. International Journal of Parasitology, vol. 44, pp. 795-810.
- Chervy, L. 2002. *The terminology of larval cestodes or metacestodes*. Systematic Parasitology, vol. 52, pp. 1-33.
- Conteh, L, Engels, T & Molyneux, D. 2010. *Socioeconomic aspects of neglected tropical diseases*. The Lancet, vol. 375, pp. 239-247.
- Digerli, S, Özçelik, S & Celiksöz A. 2005. *The distribution of intestinal parasites in patients presenting at the Parasitology Laboratory of the Cumhuriyet University*. Turkish Journal of Parasitology, vol. 29, pp. 116-119.
- Dutto, M, Giovanetti, F & Pellegrino, A. 2009. *Teniasis in a child with a finding of Taenia saginata proglottids in the school environment: a case report*. Annali di Igiene: Medicina Preventiva di Comunità, vol. 21, pp. 183-186.
- Figtree, M, Beaman, MH, Lee, R, Porter, M, Torey, E, Hugh, TJ & Hudson, BJ. 2015. *Fascioliasis in Australian travelers to Bali*. The Medical Journal of Australia, vol. 203, pp. 186-188.
- Gibson, DI, Jones, A & Bray, RA. 2002. *Keys to the Trematoda. Volume 1*. CABI Publishing, Wallingford, 521 p.
- Gomes, FF, Oliveira, FCR, Pile, EA & Lopes, CWG. 2002. *Establishment of focus of hepatic fasciolosis at property in the Municipality of Campos of Goytacazes in the state of Rio de Janeiro, Brazil*. Revista da Sociedade Brasileira de Parasitologia Veterinária, vol. 11, pp. 53-56.
- Gómez-Morales, MA, Ludovisis, A, Amati, M & Pozio, E. 2013. *Validation of an excretory/secretory antigen based-Elisa for the diagnosis of Opisthorchis felinus infection in human from low*. PLoS One, vol. 8, e62267.
- Gulsen, MT, Savas, MC, Koruk, M, Kadayifci, A & Demirci, F. 2002. *A report of five cases presenting with common bile duct obstruction*. Netherlands Journal of Medicine, vol. 64, pp. 17-19.
- Jones, A, Bray, RA & Gibson, DI. 2005. *Keys to the Trematoda. Volume 2*. CABI Publishing, Wallingford, 745 p.
- Jordan, P, Webbe, G & Strurrock, RF. 1993. *Human schistosomiasis. Volume 1*. CABI Publishing, Wallingford, 592 p.
- Joshi, G, Parchand, S, Dogra, MR, Gupta, PK, Khurana, S, Gupta, V & Gupta, A. 2012. *Live juvenile strobilate tapeworm in the anterior chamber of the human eye*. Archives of Ophthalmology, vol. 130, pp. 1464-1466.
- Hernández-Orts, JS, Scholz, T, Brabec, J, Kuzmina, T & Kuchta, R. 2015. *High morphological plasticity and global geographical distribution of the Pacific broad tapeworm Adenocephalus pacificus (syn. Diphyllbothrium pacificum): Molecular and morphological survey*. Acta Tropica, vol. 149, pp. 168-178.
- Khalil, LF, Jones, A & Bray, RA. 1994. *Keys to the Cestode Parasites of Vertebrates*. CABI Publishing, Wallingford, 751 p.
- Knoff, M, Noronha, D, Pinto, MR, Oliveira, MS, Siqueira, LR, Mattos, FB & Gomes, DC. 2010. *Coleção Helmintológica do Instituto Oswaldo Cruz. In Lamothe-Argumedo, R., Damborenea, C., García-Prieto, L., Lunaschi, L.L. & Osorio-*

- Sarabia, D. Compilers. *Guide to Helminthological Collections of Latin America*. Publicaciones Especiales del Instituto de Biología de México, vol. 22, Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Argentina, Mexico City, pp. 15-27.
- Knoff, M, Pinto, RM, São Clemente, SC, Fonseca, MCG & Gomes, DC. 2011. *Diphyllobothrium latum and Diphyllobothrium sp. as the agents of diphyllobothriasis in Brazil: morphological analysis and report of two new cases*. Revista Brasileira de Medicina Veterinária, vol. 33, pp. 159-164.
- Knoff, M & Fonseca, MCG. 2012. *Zoonose: Difilobotríase*. In: Silva-Souza, A.T., Lizama, MAP & Takemoto, RM. *Patologia e Sanidade de Organismos Aquáticos*. Ed. Massoni e Abrapoa, Maringá, p. 139-164.
- Knoff, M, São Clemente, SC, Karling, LC, Gazarini, J & Gomes, DC. 2013. *Helminhos com Potencial Zoonótico*. In: Pavanelli, GC, Takemoto, RM & Eiras, JC. *Parasitologia de peixes de água doce do Brasil*. Editora EDUEM, Maringá, p. 17-35.
- Kuchta, R, Scholz, T, Brabec, J & Bray, RA. 2008. *Suppression of the tapeworm order Pseudophyllidea (Platyhelminthes: Eucestoda) and the proposal of two new orders, Bothriocephalidea and Diphyllobothriidea*. International Journal of Parasitology, vol. 38, pp. 49-55.
- Kuchta, R, Serrano-Martínez, ME & Scholz, T. 2015. *Pacific broad tapeworm Adenocephalus pacificus as a causative agent of globally reemerging diphyllobothriosis*. Emerging Infectious Diseases, vol. 21, pp. 1697-1703.
- Lamothe-Argumedo, R, Damborenea, C, García-Prieto, L, Lunaschi, LL & Osorio-Sarabia, D. 2010. *Compilers. Guide to Helminthological Collections of Latin America*. Publicaciones Especiales del Instituto de Biología de México, vol. 22. Instituto de Biología, Universidad Nacional Autónoma de México & Museo de la Plata, Argentina, Mexico City, 60 p.
- Lemos CH & Oliveira CR. 1985. *Infestação humana pelo Dipylidium caninum*. Revista da Sociedade Brasileira de Medicina Tropical, vol. 18, pp. 267-268.
- McCleery, EJ, Patchanee, P, Pongsopawijit, P, Chailangkam, S, Tiwananthagom, S, Jongchansittoe, P, Dantrakool, A, Morakote, N, Phvu, H, Wilkins, PP, Noh, JC, Phares, C & O'Neal, S. 2015. *Taeniasis among refugees living on Thailand-Myanmar Border, 2012*. Emerging Infectious Diseases Journal, vol. 21, pp. 1824-1826.
- Mott, K & Cline, B. 1980. *Advances in epidemiology survey methodology and techniques in schistosomiasis*. Bulletin of World Health Organization, vol. 58, pp. 639-647.
- Muehlenbachs, A, Bhatnagar, J, Agudelo, CA, Hidron, A, Eberhard, ML, Mathison, BA, Frace, MA, Ito, A, Metcalfe, MG, Rollin, DC, Visvesvara, GS, Pham CD, Jones, TL, Greer, PW, Hoyos AV, Olson, PD, Diazgranados, LR & Zaki, SR. 2015. *Malignant transformation of Hymenolepis nana in a human host*. The New England Journal of Medicine, vol. 33, pp. 1845-1852.
- Noronha, D, Sá, MR, Knoff, M, Muniz-Pereira, L & Pinto, RM. 2009. *Adolpho Lutz e a Coleção Helminológica do Instituto Oswaldo Cruz*. Museu Nacional, Rio de Janeiro. 154 p.
- Omran, EK & Mohammad, AN. 2015. *Intestinal parasites in patients with chronic abdominal pain*. Journal of the Egyptian Society of Parasitology, vol. 45, pp. 389-396.
- Pantaleão, GR, Borges de Souza, AD,

- Rodrigues, ED & Coelho, AL. 2007. *The use of systemic and intravitreal steroid in inflammation secondary to intraocular cysticercosis: case report*. Arquivos Brasileiros de Oftalmologia, vol. 70, pp. 1006-1009.
- Pile, E, Santos, JAA, Pastorello, T & Vasconcellos, M. 2001. *Fasciola hepatica em búfalos (Bubalus bubalis) no município de Maricá, Rio de Janeiro, Brasil*. Brazilian Journal of Veterinary Research and Animal Science, vol. 38, pp. 42-43.
- Rajander, M, Raghu Kanth, A, Vinay Kumar, A & Rao, R. 2015. *Rare mediastinal hydatid cyst*. The Indian Journal of Chest Diseases & Allied Science, vol. 3, supl. 57, pp. 187-190.
- Rotbeck, R, Nshimiyimana, JF, Tugirimana, P, Düll, UE, Sattler, J, Hategekimana, JC, Hitayezu, J, Bruckmaier, I, Borchert, M, Gahutu, JB, Dieckmann, S, Harms, G, Mockenhaupt, FP & Ignatius, R. 2013. *High prevalence of cysticercosis in people with epilepsy in southern Rwanda*. PLoS Neglected Tropical Diseases vol. 7, e2558. doi:10.1371/journal.pntd.0002558.
- Sady, H, Al-Mekhalafi, HM, Webster, BL, Ngui, R, Atroosh, WM, Al-Delaimy, AK, Nasr, NA, Chua, KH, Lim, YAL & Surin J. 2015. *New insights into the genetic diversity of Schistosoma mansoni and S. haematobium Yemen*. Parasite Vectors, vol. 8, pp. 1-14.
- Santos, JA. 2014. *Morfologia e morfometria de espécimes de Fasciola hepatica (Linnaeus, 1758) provenientes de bovinos de diferentes áreas geográficas*. M. Sc. Dissertação de Mestrado do Programa de Pós-Graduação em Biodiversidade e Saúde, Instituto Oswaldo Cruz, Fiocruz, Rio de Janeiro, 59p.
- Saravi, KH, Fakhar, M, Nematian, J & Ghasemi, M. 2016. *Co-infection with Enterobius vermicularis and Taenia saginata mimicking acute appendicitis*. Journal of Infection and Public Health, doi: 10.1016/j.jiph.2015.11.013.
- Schmidt, GD. 1986. *CRC Handbook of Tapeworm Identification*. CRC Press, Inc., Boca Raton, Florida, 675 p.
- Siqueira, NG, Almeida, FB, Suzuki, YA, Lima, RN, Machado-Silva, JR & Rodrigues-Silva, R. 2010. *Atypical polycystic echinococcosis without liver involvement in Brazilian patients*. Transactions of the Royal Society of Tropical Medicine & Hygiene, vol. 104, pp. 230-233.
- Soares, MCP, Moreira-Silva, CA, Alves, MM, Nunes, HM, Amaral, IA, Moia LJ, Conde, SR, Almeida, FB, Rodrigues-Silva, R & Crescente, JA. 2004. *Polycystic echinococcosis in the Eastern Brazilian Amazon: an update*. Revista da Sociedade de Medicina Tropical, vol. 37, pp. 75-83.
- Tiwari, S, Karuna, T & Rautaraya, B. 2014. *Hymenolepis diminuta infection in a child from a rural area: a rare case report*. Journal of Laboratory Physicians, vol. 6, pp. 58-59.
- Travassos, L, Freitas, JFT & Kohn, A. 1969. *Trematódeos do Brasil*. Memórias do Instituto Oswaldo Cruz, vol. 67, pp. 1-886.
- Verster, A. 1969. *A taxonomic revision of the genus Taenia Linnaeus, 1758 s. str.* Onderstepoort Journal of Veterinary Research, vol. 36, pp. 3-58.
- Waloch, M. 2005. *Cestode infections in Poland in 2003*. Przegand epidemiologiczny, vol. 59, pp. 331-335.
- Yamaguti, S. 1971. *Synopsis of the Digenetic Trematodes of Vertebrates. Systema Helminthum. Vols. 1 and 2*. Keigaku Publishing Company, Tokyo, 1074 p., 349 pl.
- Zanzani, SA, Di Cerbo, AR, Gazzonis, AL, Genchi, M, Rinaldi, L, Musella, V, Cringoli, G & Manfredi, MT. 2014. *Canine fecal contamination in a*

metropolitan area (Milan, North-Western Italy): prevalence of intestinal parasites and evaluation of health risks. The Scientific World Journal, vol. 2014, article ID 132361, pp. 1-6.

Received March 14, 2016.
Accepted April 15, 2016.