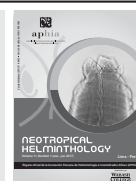




Neotropical Helminthology



REVIEW ARTICLE/ ARTÍCULO DE REVISIÓN

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

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

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ABSTRACT

Data on platyhelminth parasites of humans deposited in Helminthological Collection of the Oswaldo Cruz Institute (CHIOC), Rio de Janeiro, Brazil, have been reported only recently. The present study addresses the checklist of nematode parasites of humans. There are several types of helminths deposited in CHIOC, including parasites of medical and veterinary importance. The samples are stored as wet material and/or as whole mounts. A survey of samples in the computerized database and its catalog cards was made. A total of 169 catalog cards with 176 samples with 15 species were analyzed. Listed records included the deposit number, date of collection, geographical distribution, site of infection and the developmental stage. The species with highest number of deposits was adults of *Necator americanus* (Stiles, 1902) mostly from the State of Rio de Janeiro, Brazil. The first deposit was specimens of *N. americanus* adults CHIOC 3 without information of date of collection and deposit, from Rio de Janeiro, State of Rio de Janeiro, Brazil, and the last deposit was of an adult *Lagochilascaris minor* Leiper, 1909, CHIOC 33597, collected in 1997, deposited on 23 January 1998, from State of Pará, Brazil.

Keywords: CHIOC – human – Nematoda

RESUMEN

Recientemente, se han presentado datos sobre lista de verificación de los platelmintos parásitos de los seres humanos depositados en Helminthological Colección del Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, Brasil. El presente estudio se relaciona con la lista de verificación de los nematodos parásitos de humanos. Existen varios tipos de helmintos depositados en la CHIOC, incluidos los parásitos de importancia médica y veterinaria. Las muestras están depositadas como material líquido o montaje final. Para obtener el conocimiento de los nematodos 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 169 fichas de catálogo con 176 muestras depositadas con 15 especies. Una lista de estos helmintos se generó a partir del número de depósito de las muestras analizadas, que fueron incluidas información sobre la fecha de recogida, distribución geográfica, el sitio de infección y el estado ontogenético. La especie con mayor número de depósitos es *Necator americanus* (Stiles, 1902) adulta del intestino y la mayoría de ellos son del Estado de Rio de Janeiro, Brasil. El primer depósito fue *Necator americanus* adulto, CHIOC 3 sin información de fecha de colecta y depósito, del Rio de Janeiro, Estado de Rio de Janeiro, Brasil, y el último depósito fue un *Lagochilascaris minor* Leiper, 1910, CHIOC 33597, colectado el 1997, depositado el 23 de Enero de 1998, del Estado de Pará, Brasil.

Palabras clave: CHIOC – humano – Nematoda

INTRODUCTION

The Helminthological Collection of Oswaldo Cruz Institute for more than a century has received helminth deposits of several researchers not only in Brazil but some from abroad, including those of medical and veterinary importance. Recently data on checklist of platyhelminth parasites of humans deposited in Helminthological Collection of the Oswaldo Cruz Institute (CHIOC), Brazil have been reported (Sanches *et al.*, 2016).

The present study aimed to give the continuity of checklist of helminths parasites of human reporting the effort to list all the nematode 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 nematode 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 169 catalog cards and 176 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 Adamson (1987), Blaxter *et al.* (1998), De Ley & Blaxter (2002, 2004), Anderson *et al.* (2009) and Gibbons *et al.* (2010).

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 169 records cataloged in the CHIOC about the Nematoda parasitizing humans with 15 species, the species with highest number of deposits was adults of *Necator americanus* (Stiles, 1902), mostly from the State of Rio de Janeiro, Brazil. The percentage of deposits in the CHIOC were distributed differently among the world countries, Brazil (81.5%), Japan (4.1%), Guatemala (1.2%), Mexico, French Guiana and Paraguay (1% each one), and without information about geographic distribution (6.5%); among the States of Brazil, Rio de Janeiro (81.5%), Bahia (8.2%), Pernambuco (4.1%), Rio Grande do Sul (1.4%), São Paulo, Minas Gerais, Sergipe and Pará (0.7% each one), and without a specific State (2%); among the ontogenetic stages, adults (76.3%), eggs (14.2%) and larvae (9.5%). From all deposits 88.8% were from enteroparasites. The first deposit of the nematodes was adults of *N. americanus* CHIOC 3 without information of date of collection and deposit, from Rio de Janeiro, State of Rio de Janeiro, Brazil, and the last deposit was of an adult of *Lagochilascaris minor* CHIOC 33597, collected in 1997, deposited in 23 January 1998, from State of Pará, Brazil.

The checklist of these species is showed below.

Phylum Nematoda Rudolphi, 1808
 Class Enoplea Inglis, 1983
 Order Trichinellida Hall, 1916
 Superfamily Trichinelloidea Ward, 1907
 Family Trichuridae Ransom, 1911
 Genus *Trichuris* Roederer, 1761
Trichuris trichiura (Linnaeus, 1771), CHIOC: 37, October, 1909, Rio de Janeiro, RJ, Brazil, large intestine, eggs; CHIOC: 54, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 189, August, 1913, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 203, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 467, 1915, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 515, October 27, 1908, Rio de Janeiro, RJ, Brazil, intestine and caecum, eggs; CHIOC: 516, September 15, 1913, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 517, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 518, December,

1910, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 914, November, 1908, Rio de Janeiro, RJ, Brazil, intestine, eggs; CHIOC: 925, Rio de Janeiro, RJ, Brazil, large intestine, adult; CHIOC: 926, Bahia, Brazil, large intestine, adult; CHIOC: 1422, 1916, Bahia, Brazil, intestine, adult; CHIOC: 1477, Bahia, Brazil, large intestine, adult; CHIOC: 2028, Bahia, Brazil, large intestine, adult; CHIOC: 4288, September, 1917, Bahia, Brazil, large intestine, adult; CHIOC: 4619, January 18, 1923, Rio de Janeiro, RJ, Brazil, large intestine, adult; CHIOC: 4958, April, 1925, Rio de Janeiro, RJ, Brazil, large intestine, adult; CHIOC: 5905, December, 1927, Rio de Janeiro, RJ, Brazil, caecum, adult; CHIOC: 8183, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 12435, February, 1942, Rio de Janeiro, RJ, Brazil, caecum appendix, eggs; CHIOC: 17715, December, 1978, faeces, adult; CHIOC: 25942, Brazil, apêndix, eggs; *Trichuris* sp. (Roederer, 1761), CHIOC: 9978, April 10, 1930, Rio de Janeiro, RJ, Brazil, caecum, adult; CHIOC: 9979, Rio de Janeiro, RJ, Brazil, caecum, adult; CHIOC: 10006, August 24, 1935, Rio de Janeiro, RJ, Brazil, caecum; CHIOC: 10042, August 24, 1935, Rio de Janeiro, RJ, Brazil, caecum, adult; CHIOC: 10043, August 24, 1935, Rio de Janeiro, RJ, Brazil, caecum, adult.

Classe Chromadorea Inglis, 1983
 Subclass Chromadoria Pearse, 1942
 Order Rhabditida Chitwood, 1933
 Suborder Rhabditina Chitwood, 1933
 Family Strongyloidea Chitwood & McIntosh, 1934
 Genus *Strongyloides* Grassi, 1879
Strongyloides stercoralis (Bavay, 1876), CHIOC: 1799, October 18, 1919, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 1859, November, 1919, Rio de Janeiro, RJ, Brazil, faeces, eggs; CHIOC: 1860, November, 1919, Rio de Janeiro, RJ, Brazil, faeces, eggs; CHIOC: 1861, November, 1919, Rio de Janeiro, RJ, Brazil, faeces, eggs; CHIOC: 1862, November, 1919, Rio de Janeiro, RJ, Brazil, faeces, eggs; CHIOC: 5907, December, 1927, Rio de Janeiro, RJ, Brazil, small intestine, eggs; CHIOC: 9756 a-f, Rio de Janeiro, RJ, Brazil, large intestine, eggs; .

Infraorder Rhabditomorpha Deley & Blaxter, 2002
 Superfamily Strongyloidea Baird, 1853
 Family Ancylostomatidae Looss, 1905
 Genus *Necator* Stiles, 1902

Necator americanus (Stiles, 1902), CHIOC: 3, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 61, Rio de Janeiro, RJ, Brazil, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 62, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 63, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 80, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 87, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 115, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 150, adult; CHIOC: 152, December, 1910, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 171, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 185, small intestine, adult; CHIOC: 187, Bahia, Brazil, intestine, adult; CHIOC: 219, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 270, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 298, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 300, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 389, January 15, 1915, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 574, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 575, July 20, 1908, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 576, Rio de Janeiro, duodenum, adult; CHIOC: 577, February, 1910, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 578, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 579, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 585, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 586, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 587, Rio de Janeiro, small intestine, adult; CHIOC: 927, BA, Brazil, intestine, adult; CHIOC: 1043, December 2, 1914, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 1047, December 2, 1914, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 1322, Rio de Janeiro, RJ, Brazil, small intestine; CHIOC: 1421, 1916, BA, Brazil, intestine, adult; CHIOC: 1521, September, 1918, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 2125, November, 1920, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 2218, May, 1909, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 4618, November, 1920, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 4747, September 20, 1924, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 4748, September, 1924, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 4749, September 3, 1924, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 4750, September 23, 1924, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC:

4751, October 5, 1924, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 4752, August 31, 1924, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 4753, September 9, 1924, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 4754, September 4, 1924, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 4914, October 21, 1922, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 5906, December, 1927, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 9989, June, 1932, Rio de Janeiro, RJ, Brazil, small intestine, adult.

Genus *Ancylostoma* (Dubini, 1843)

Ancylostoma duodenale (Dubini, 1843), CHIOC: 15, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 148, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 186, BA, Brazil, small intestine, adult; CHIOC: 383, January 15, 1915, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 588, December, 1910, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 589, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 592, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 643, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 644, September, 1909, intestine, eggs; CHIOC: 932, BA, Brazil, intestine, adult; CHIOC: 1046, December 2, 1914, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 1420, 1916, BA, Brazil, intestine, adult; CHIOC: 2126, November, 1920, Rio de Janeiro, RJ, Brazil, CHIOC: 4913, October 21, 1922, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 4957, April, 1925, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 5007, Rio de Janeiro, RJ, Brazil, duodenum, adult; CHIOC: 6334, BA, Brazil, intestine, adult; CHIOC: 7186, May 5, 1930, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 8958, 1933, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 8998, Rio de Janeiro, RJ, Brazil, small intestine, adult.

Family Syngamidae Leiper, 1912

Genus *Mammomonogamus* Ryjikov, 1948

Mammomonogamus laryngeus (Railliet, 1899), CHIOC: 32109, November, 1983, Rio de Janeiro, RJ, Brazil, larynx; *Mammomonogamus* sp., CHIOC: 18028, the nasal cavity sputum, adult.

Family Trichostrongylidae Witenberg, 1925

Genus *Haemonchus* Coob, 1898

Haemonchus contortus (Rudolphi, 1818), CHIOC: 17719, Santo Vitório do Palmar, RS, Brazil,

estomach.

Genus *Trichostrongylus* Loos, 1905

Trichostrongylus orientalis Juibo, 1915, CHIOC: 1491, 1916, Japão, intestine, adult; CHIOC: 1492, 1916, Japão, intestine, adult; CHIOC: 1502, 1916, Japão, intestine, eggs; CHIOC: 5834, Japão, adult; CHIOC: 5835, Japão, adult; CHIOC: 9424, 1916, Japão, intestine, adult; CHIOC 9425, 1916, Japão, intestine, adult.

Suborder Spirurina Railliet & Henry, 1915

Infraorder Ascaridomorpha Deley & Blaxter, 2002

Superfamily Ascaridoidea Baird, 1853

Family Ascarididae Baird, 1853

Genus *Ascaris* Linnaeus, 1758

Ascaris lumbricoides Linnaeus, 1758, CHIOC: 43, April 25, 1911, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 231, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 520, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 521, March, 1911, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 524, Rio de Janeiro, RJ, Brazil, intestine, adult; CHIOC: 525, March 19, 1908, intestine, adult; CHIOC: 527, Rio de Janeiro, RJ, Brazil, adult; CHIOC 700, liver, eggs; CHIOC 701, adult; CHIOC:1359, September 12, 1916, faeces, eggs; CHIOC: 1813, October 11, 1919, Rio de Janeiro, RJ, Brazil, intestine, stomach, esophagus, adult; CHIOC: 1858, October 11, 1919, Rio de Janeiro, RJ, Brazil, intestine, stomach, esophagus, larva; CHIOC: 1864, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 1875, 1919, Rio de Janeiro, RJ, Brazil, intestine, eggs; CHIOC: 1876, 1919, Rio de Janeiro, RJ, Brazil, intestine, eggs; CHIOC: 2108, August 23, 1920, São Paulo, SP, Brazil, faeces, adult; CHIOC: 2275, December, 1920, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 4569, December 28, 1922, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 4570, 1922, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 4597, December 14, 1921, faeces, adult; CHIOC: 5455, May 10, 1921, Rio de Janeiro, RJ, Brazil, small intestine, eggs; CHIOC: 5456, September 27, 1922, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 5766, May 4, 1923, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 6239, October 10, 1928, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 7391, May 27, 1932, Rio de Janeiro, RJ, Brazil, small intestine, adult; CHIOC: 8283, Rio de Janeiro, RJ, Brazil, liver, eggs; CHIOC: 13996, 1935, Cachoeira, RS,

Brazil, gallbladder, larva; CHIOC: 17405, Brazil, eggs.

Genus *Lagochilascaris* Leiper, 1909

Lagochilascaris minor Leiper, 1910, CHIOC: 33597, January 23, 1998, PA, Brazil, intramastoid and cranial abscess, adult.

Order Oxyuridomorpha Deley & Blaxter, 2002

Superfamily Oxyuroidea Cobbold, 1864

Family Oxyuridae Cobbold, 1864

Genus *Enterobius* Leach, 1853

Enterobius vermicularis (Linnaeus, 1758), CHIOC: 57, Rio de Janeiro, RJ, Brazil, large intestine, eggs; CHIOC: 374, May, 1915, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 755, February 2, 1914, Rio de Janeiro, RJ, Brazil, adult; CHIOC: 847, 1915, Rio de Janeiro, RJ, Brazil; CHIOC: 884, July, 1916, Rio de Janeiro, RJ, Brazil, faeces; CHIOC: 1570, 1916, Rio de Janeiro, RJ, Brazil, large intestine, adult; CHIOC: 1808, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 1964, April 5, 1920, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 4605, December 14, 1921, Rio de Janeiro, RJ, Brazil, faeces, adult; CHIOC: 4657, November 24, 1923, Rio de Janeiro, RJ, Brazil, large intestine, eggs; CHIOC: 5317, October 14, 1925, Rio de Janeiro, RJ, Brazil, large intestine, adult; CHIOC 18970, October, 1943, Asuncion Paraguay, faeces, adult; CHIOC 29296, Rio de Janeiro, RJ, Brazil, faeces.

Superfamily Dracunculoidea Stiles, 1907

Family Dracunculidae Stiles, 1907

Genus *Dracunculus* (Reichard, 1759)

Dracunculus medinensis Linnaeus, 1758, CHIOC: 8285, intestine, tissue connective.

Infraorder Spiruromorpha Deley & Blaxter, 2002

Superfamily Filarioidea Weiland, 1858

Family Onchocercidae Leiper, 1911

Genus *Wuchereria* Silva Araújo, 1877

Wuchereria bancrofti (Cobbold, 1877), CHIOC: 1394, 9 April, 1916, SE, Brazil, blood, microfilaria; CHIOC 2726, May, 1920, Belo Horizonte, MG, Brazil, microfilaria; CHIOC: 21816, 1954, Recife, PE, Brazil, blood, microfilaria; CHIOC: 21817, 1954, Recife, PE, Brazil, blood, microfilaria; CHIOC: 21818, 1954, Recife, PE, Brazil, blood, microfilaria; CHIOC: 21819, 1954, Recife, PE, Brazil, blood, microfilaria; CHIOC: 26969, November 10, 1951,

Recife, PE, Brazil, blood, microfilaria; CHIOC: 26970, November 9, 1951, Recife, PE, Brazil, blood, microfilaria.

Genus *Onchocerca* Diesing, 1841

Onchocerca volvulus (Bickel, 1982), CHIOC: 13757, Huixtla, Mexico, nodules; *Onchocerca* sp. Diesing, 1841, CHIOC: 19630, Guatemala, nodules; CHIOC: 19821, Guatemala, nodules.

Family Filariidae Weinland, 1858

Genus *Diriofilaria* Railliet & Henry, 1911

Diriofilaria spectans Lent & Freitas, 1949, CHIOC: 19557, July 15, 1952, Rio de Janeiro, RJ, Brazil, fifth finger of the left hand, adult.

Genus and species not identified

Microfilaria CHIOC: 9374, 1910, blood;

Filaria CHIOC 9376, epididymis; CHIOC: 18032, September 28, 1940, French Guiana, eye.

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; Sanches *et al.*, 2016).

Trichuris trichiura that causes trichiuriasis a helminthiasis of high incidence in developing countries. Epidemiological surveys in Brazil in the late 60's, show a higher prevalence of *T. trichiura* in the States of North and Northeast. Different rates of South and Southeast that were lower, probably due to socio-economic, health and educational conditions (Negrão-Corrêa, 2010). The samples deposited in CHIOC are from the States of Rio de Janeiro and Bahia, Brazil, the latter with larger deposits.

Strongyloides stercoralis is endemic in tropical and temperate climates, causative agent of strongyloidiasis, which can lead to systemic complications in immunocompromised individuals and in some cases lead to death (Becker *et al.*, 2011; Khieu *et al.*, 2014; Vonghachack *et al.*, 2015). The samples of CHIOC are from the State of Rio de Janeiro, Brazil.

The hookworm species deposited in CHIOC are related to two species: *Necator americanus* and *Ancylostoma duodenale*. These hookworms are intestinal parasites which occur mainly in developing countries in Africa, Asia and the Americas. They are causing the ancylostomiasis, known for establishing a long-term relationship in their human hosts with a subtle and chronic, but insidious, pathogenesis, usually in the form of iron deficiency anemia, derived by feeding blood parasite that over time, has devastating effects on the human host, especially when it comes to children or women of childbearing age (Andrade *et al.*, 2010; Periago & Bethony, 2013). At this disease has been attributed stunted growth and cognitive impairment of malnourished children in these countries (Ojha *et al.*, 2014). The samples of *N. americanus* deposited in CHIOC are from the States of Rio de Janeiro and Bahia, Brazil, the first and with higher number of deposits, and the samples of *A. duodenale* are from Rio de Janeiro and Bahia, Brazil, corroborating the previous information.

Mammomonogamus laryngeus has been reported occurring in some countries as Brazil, Honduras, Venezuela, Colombia and the Philippines parasitizing humans, less frequently than other nematodes (Echeverry *et al.*, 2011). The samples deposited in CHIOC are from the State of Rio de Janeiro, Brazil corroborating previous reports.

Haemonchus contortus is a common parasite of ruminants, which develops well in areas with hot and humid weather conditions. Some cases have been registered for humans (Acha & Szyfres, 2003; Terril *et al.*, 2012). The sample deposited in CHIOC is from the State of Rio Grande do Sul, Brazil.

Trichostrongylus orientalis is the predominant species in human infectious causing the trichostrongyliasis can be found in Asia, mainly in

Korea and Japan, and parts of Africa, (Acha & Szyfres, 2003). The samples deposited in CHIOC are from Japan, corroborating previous reports.

Ascaris lumbricoides causing the ascariasis which mainly affects children of school age, which has always been associated with impaired physical and intellectual development, mainly from Central and South America (Ogliari & Passos, 2002; Acha & Szyfres, 2003; Saturnino *et al.*, 2003; Silva *et al.*, 2011). Eggs and larvae are found in all states of Brazil, even considered prime areas (Souza *et al.*, 2007). Among other parasite species is one of the most common human helminths, and has been correlated with high levels of morbidity and mortality (Barbosa *et al.*, 2012). It is the human parasitic nematode that has the second highest number of records in CHIOC. The samples deposited in CHIOC are from the State of Rio de Janeiro, Brazil.

Lagochilascaris minor causing the lagochilascariasis, occurs in Latin America and Caribbean (Acha & Szyfres, 2003). The sample deposited in CHIOC is from State of Pará, Brazil (Lanfredi *et al.*, 1998).

Enterobius vermicularis causing enterobiasis has wide geographical distribution and thriving well into temperate zones of the world, man is its unique host (Ediriweera *et al.*, 2013). The samples deposited in CHIOC are from Paraguay and State of Rio de Janeiro, Brazil.

Dracunculus medinensis causing dracunculiasis it is mainly found in tropical and subtropical regions such as Africa and Asia (Acha & Szyfres, 2003; Eberhard *et al.*, 2014). Travassos (1915) referred the presence of this helminth in Brazil parasitizing humans until the end of the XIX century: "...Este parasito que, como a *Filaria sanguinis-hominis*, parece ter sido importado da Africa, foi comum entre nós, hoje, porém, parece inteiramente desaparecido. A primeira referencia feita sobre a presença deste parasito no Brazil foi de Sigaud, segundo Silva Lima. Foi bem estudado entre nós por, Silva Lima, Victorino Pereira, Magalhães, etc. ...". The sample deposited in CHIOC there is only the information that was collected by Oswaldo Cruz and determined by Travassos, there is no information on the geographical distribution, neither the date of collection.

The filariasis caused by *Wuchereria bancrofti* occurs mainly in China, Indonesia, India and African countries (WHO, 1992), with multiple reports in humans in Brazil mainly in Pernambuco (Acha & Szyfres, 2003). It is earmarked for elimination by the year 2020 through the Global Programme for the Elimination of Lymphatic Filariasis (de Souza *et al.*, 2014). The samples in CHIOC are from the States of Sergipe, Minas Gerais and Pernambuco, Brazil.

Onchocerca volvulus is the causative agent of onchocerciasis, known as "river blindness", and affects people in the world can be found in the Arabia, Guatemala, Congo, Mexico and Colombia, in some small communities in Africa, and Central and South America such as Brazil and Venezuela (Acha & Szyfres, 2003; Winkler *et al.*, 2008; Kaiser *et al.*, 2010; Otranto *et al.*, 2012). The sample deposited in CHIOC is from Mexico corroborating with above information.

Dirofilaria spectans it is a filariasis has been reported in countries in Asia such as Japan, and the Americas from Puerto Rico to Argentina including Brazil (Acha & Szyfres, 2003; Reddy, 2013). The sample in CHIOC is from the State of Rio de Janeiro corroborating with previous information.

The samples of nematode species deposited in CHIOC as microfilaria and filaria specimens were collected on the: a) blood by Gaspar Vianna in 1910, there was no information about the geographical distribution (blood smear slide CHIOC 9374); b) epididymis, there was no information about the geographical distribution and date of collection (histological cross-section slide CHIOC 9376); c) on the eye (wet material preserved in acetic formalin CHIOC 18032). After they have been analyzed by microscopy it was not possible to identify the species.

In some smear samples with filariae and mounted between slide and cover slip, were deteriorated, making it difficult to analyze them.

The Nematoda 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.

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