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PREVALENCE OF ENTERIC PARASITIC DISEASES IN CHILDREN AND TEENAGERS ATTENDED BY SOCIAL SERVICES IN SOROCABA – SP

AVALIAÇÃO DA PREVALÊNCIA DE ENTEROPARASITOSES EM CRIANÇAS E ADOLESCENTES ATENDIDOS POR UMA AÇÃO SOCIAL NA CIDADE DE SOROCABA – SP

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ABSTRACT

Enteric parasitic diseases pose a major health issue in Brazil. Children living in poorer areas are particularly more likely to become infected with parasites, as inadequate living conditions favor dissemination of such parasites. This work aimed to determine prevalence of parasites in stool samples obtained from children and teenagers supported by social services in the city of Sorocaba – São Paulo. Three stool samples were collected from each child enrolled in the study; samples were subjected to spontaneous sedimentation and then analyzed under a microscope. Children (or any close relatives for them responsible) answered a form regarding education level, eating habits, having had previous enteric parasitic diseases and presence of symptoms associated with such diseases. Prevalence of enteric parasitic diseases was 30%, these being caused by *Entamoeba coli* (20%), *Giardia lamblia* (2.5%), *Iodamoeba butschlii* (2.5%) and *Urbanorum* spp. (5%), no helminths were identified. While there is a likely contamination of children and teenagers via drinking water and food, prevalence of enteric parasitic diseases was lower when compared to other studies found in scientific literature, most likely due to local families being supported by social services.

Keywords: Children. Enteric parasitic diseases. Social services.

RESUMO

As parasitoses intestinais constituem um grave problema de saúde pública no Brasil. Crianças são particularmente vulneráveis a infecção, principalmente nas populações de baixa renda, na qual as condições de habitação promovem ambiente propício à contaminação e disseminação. O objetivo desta pesquisa foi determinar a prevalência de parasitos em amostras de fezes de crianças e adolescentes atendidos em uma ação social na cidade de Sorocaba - SP. Foi realizada a coleta de três amostras de fezes de cada criança; o material foi analisado por técnica de sedimentação espontânea seguida por microscopia. Um questionário foi aplicado para coleta de dados sobre escolaridade, hábitos alimentares, enteroparasitoses anteriores e a presença de sintomas relacionados às parasitoses. A prevalência de enteroparasitoses encontrada foi de 30%, sendo estas ocasionadas pelos protozoários *Entamoeba coli* (20%), *Giardia lamblia* (2,5%), *Iodamoeba butschlii* (2,5%) e *Urbanorum* spp. (5%), não sendo observada infecção por helmintos. Neste estudo, foi possível identificar uma provável contaminação de água e alimentos consumidos pelas crianças, porém com baixa frequência de resultados positivos quando comparados com os descritos na literatura geral em consequência da assistência da ação social às crianças e famílias atendidas.

Palavras-chave: Ação social. Crianças. Enteroparasitoses.

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INTRODUCTION

Enteric parasitic diseases are infections caused by protozoa or gut helminths and are of serious concern for public health agencies in Brazil (MOREIRA *et al*., 2019). Factors contributing to this issue include lack of basic sanitation in several regions, tropical climate throughout most of Brazil which favors parasite proliferation and low income of families living in areas of high parasite prevalence (FERREIRA; LALA; MONTEIRO, 2006; FERRAZ *et al.*, 2014).

Estimates indicate that around 3.5 billion of people in the world are infected with gut parasites; 450 million of these are children, and 2 to 3 million of these die every year (SILVA, 2017). Among several parasites, the main species associated with these numbers are *Ascaris lumbricoides, Trichuris trichiura, Necator americanus* and *Ancylostoma duodenale* (FERREIRA; FERREIRA; MONTEIRO, 2000). Generally, transmission of enteric parasitic diseases is oro-fecal, involving ingestion of eggs or cysts present in food, water or any other objects contaminated with stool (RONDÓN, 2016). Also, areas of low social income usually lack proper readily available medical assistance and basic sanitation; high prevalence of reservoirs and vectors favor contamination of water and food (BIANCHINI *et al.*, 2015).

Young children are the most likely to be infected with enteric parasites due to person-to-person contact, this being aggravated by inadequate hygiene habits and an underdeveloped immune system. Frequent contact with water and soil makes children even more vulnerable (MELO; FERRAZ; ALEIXO, 2010; ARAUJO FILHO *et al.*, 2011). Among several clinical complications associated with enteric parasitic diseases at this age, intestinal obstruction, severe malnutrition, iron-deficient anemia, diarrhea, impaired growth and reduced learning are common. Also, such diseases can also lead to death and are important contributors for mortality of young children in poorer areas (FERREIRA; LALA; MONTEIRO, 2006; ARAUJO FILHO, 2011; BIANCHINI *et al.*, 2015).

In the last years, few epidemiological works were carried out aiming to assess the incidence of parasitic diseases in Brazil. A study carried out by Silva *et al.* (2009) in Coaris – Amazonas showed that 73% of the sampled children tested positive for *Ascaris lumbricoides, Trichuris trichiura, Entamoeba* spp. and *Giardia lamblia.* Another study carried out by Pittner *et*. (2007) in nurseries and schools in Guarapuava – Parana revealed that 60.59% of stool samples were positive for at least one parasite, the most prevalent ones being *Giardia lamblia* and *Ascaris lumbricoides*. In Catanduva – Sao Paulo, a study by Biscegli *et al.* (2009) showed 29% of assessed children in a nursery were positive for *Giardia lamblia* or *Entamoeba coli* (BISCEGLI *et al.*, 2009). These studies indicate that the most prevalent enteric parasitic diseases caused by helminths in Brazil are represented by ascaridiasis and trichuriasis, while giardiasis and amebiasis constitute the most prevalent ones caused by protozoa (ANDRADE; DE SÁ; BEZAGIO, 2017; ANTUNES; SANTOS, 2017).

As there is a clear association between a higher prevalence of enteric parasitic diseases and socially vulnerable children, this work aimed to identify the prevalence of enteric parasitic diseases in children and teenagers supported by social services in the municipality of Sorocaba – Sao Paulo.

MATERIAL AND METHODS

Inclusion of subjects

A total of 40 children supported by local social services in the municipality of Sorocaba – Sao Paulo were included in this study. The studied population is very socially vulnerable, lacking proper access to basic health services, education and leisure. The area inhabited by the study population also severely lacks in basic sanitation.

Ethics

All procedures carried out in this study have been approved by the Committee for Ethics in Research of the University of Sorocaba (CAAE n.° 27168019.1.0000.5500).

Studied population

At first, parents (or any other legal caretakers) were approached and the study design was explained. All parents signed a form attesting their participation was of free-will and that they understood the significance of the study and the methods utilized. Then, parents or caretakers answered a form regarding education level, eating habits and presence of symptoms associated with enteric parasitic diseases of their children and also regarding their own sociocultural and economic levels. Data were gathered at the site where children were tended to by local social services.

After authorization of their parents or legal caretakers, children were introduced to the study via educational material specifically designed for this task. Once having understood the study design and having agreed in participating, children signed a form attesting their participation was of free-will. It was then explained to the children how biologic material would be collected for analysis of enteric parasites latter on.

Collection and analysis of feces

For collection of feces, 3 flasks were made available for each child so multiple samples would be obtained in alternating days (PARATEST ECO DUO Greenfix®, DK Diagnostics). In each flask, 2 grams of fresh sample were collected according to manufacturer's instructions. Flasks were labeled and taken to a laboratory for analysis. Samples were assessed via microscopy by two independent analysts.

Inclusion / exclusion criteria

Only children and teenagers that were tended to by social services in the assessed area which accepted of free will participating of the study were included in the study. Further on, samples with invalid diagnosis due to children having taken anti-helminth drugs at least 30 days prior to sample collection were not included in further analyses.

Data analysis

Data collected via forms were compiled according to sex, age and education level of the children alongside information regarding number of people living in a household, access to sewage systems, use of tap water, presence of kitchen gardens and also regarding hygiene habits, such as washing of hands and of food before eating. Percentage of children affected by parasites was also determined. Data were also assessed via Fisher exact tests to determine whether associations between the results of parasite tests and other variables were significant. Results were considered statistically significant when $p < 0.05$. Analyses were carried out utilizing GraphPad Prism 7.0®.

RESULTS AND DISCUSSION

Samples from a total of 42 children were analyzed; 2 samples were excluded from the study as they were obtained from children which had taken anti-parasitic drugs in the last 30 days prior to sample collection. Table 1 shows data referring to hygiene habits and overall characteristics of the studied population.

Table 1 – Characteristics and hygiene habits of the studied population.

Variables		**N = 40**	**(%)**
Gender	Female	16	40
	Male	24	60
Age	0 - 4 years old	7	17.5
	5 - 9 years old	20	50
	10 - 14 years old	10	25
	15 - 20 years old	3	7.5
Schooling	Pre-school	3	7.5
	Primary school	18	45
	Middle school	7	17.5
	High school	2	5
	No schooling	10	25
Household inhabitants	Up to 2 people	0	0
	3 - 5 people	27	67.5
	More than 6 people	13	32.5
Sewage systems	Yes	19	47.5
	No	21	52.5
Water source	Tao water	28	70
	Well	7	17.5
	Mineral water	5	12.5
Washing hands before eating	Yes	36	90
	No	4	10
Washing hands after toilet	Yes	38	95
	No	2	5
Washing of fruits and vegetables	Yes	39	98
	No	1	2

Source: The authors.

Table 2 – Data regarding kitchen gardens, pet animals and intake of antiparasitic drugs

Variables		**n=40**	**(%)**
Kitchen garden	Yes	11	27.5
	No	29	72.5
Pet animals	Yes	26	65
	No	14	35
Pet animals accessing kitchen gardens	Yes	6	15
	No	34	85
Use of human or animal feces as fertilizer	Yes	3	7.5
	No	37	92.5
Diarrhea in the last 6 months	Yes	0	0
	No	40	100
Use of antiparasitic drugs	Yes	21	525
	No	19	47.5

Source: The authors.

Analysis of stool samples revealed 12 children suffered from enteric parasitic diseases (30%), the highest number of cases being attributed to *Entamoeba coli* (9 cases). Only one child had more than one parasite. These results are compiled in Table 3.

Table 3 – Distribution of intestinal parasites according to sex.

Intestinal parasites	Male (n=24)	Female (n=16)	Total (n=40)
No parasites	15	13	28 (70%)
Detected parasites	9	3	12 (30%)
Giardia lamblia	0	1	1 (2.5%)
Iodamoeba butschlii	0	1	1 (2.5%)
Entamoeba coli	7	2	9 (22.5%)
Urbanorum spp.	2	0	2 (5%)

Source: The authors.

Data obtained were categorized and correlated, as shown in Table 4, and associations between the number of children presenting enteric parasitic diseases and other variables were tested. Significant associations were found between number of infected children and number of individuals in a household, where the higher the number of individuals, the more the likelihood of a child having any parasitosis. Associations close to significance were also found between number of infected children and consumption of tap water and gender, where the chance of children consuming tap water and male children having any parasitosis is 3 and 3.5 times higher, respectively.

Table 4 – Fisher exact tests comparing associations between parasitosis prevalence and other variables.

Dependent variables	p value	Odds-ratio
Gender	0.103	3.59
Age	0.7159	1.667
Education level	>0.9999	0.9167
Number of household individuals	0.0035	Infinity
Water source	0.1788	3
Sewage systems	>0.9999	0.8667
Pet animals	0.7144	1.765
Kitchen garden	0.1209	0.1455
Pet animals accessing kitchen gardens	0.375	Infinity
Use of antiparasitic drugs	0.4945	0.5357

Note: prevalence of enteric parasitic diseases is the independent variable.
Source: The authors.

Enteric parasitic diseases are a difficult challenge to be tackled by public health organizations, especially in areas of high social vulnerability. In the present study, the prevalence of parasitic diseases was reasonably low despite the population assessed being of high social vulnerability.

Social data revealed that 50% of the assessed children are aged between 5 and 9 years old, 25% of them do not attend any schools, 52% do not have access to sewage systems and 70% consume tap water. The immune system of children older than 10 years old is usually more developed than that of younger children, explaining why there was a lower prevalence of intestinal parasites in older children (BANHOS *et al*., 2017). In the present study and also in the studies by Silva *et al.* (2005), Baptista *et al.* (2006) and Silva *et al. (*2011) it is evident that conditions of sanitation are correlated with higher prevalence of intestinal parasites. Children assessed in the present study are at a higher risk for development of enteric parasitic diseases.

According to Manfroi, Stein and Castro-Filho (2009), species of parasites more easily detected in children are *Ascaris lumbricoides, Ancylostoma duodenale, Schistossoma mansoni, Strongyloides stercoralis, Giardia lamblia, Entamoeba coli, Entamoeba histolytica and Iodamoeba butschilli*. A previous study carried out in Sorocaba – São Paulo in the Vila Fiori and Márcia Mendes neighborhoods revealed a prevalence of intestinal parasites in 50% and 33% of samples analyzed,

respectively, of which the most prevalent species were *Entamoeba coli* and *Giardia lamblia;* even though the studied sample in this work was comprised of both adults and children amounting to a total of 60 subjects (PERES *et al*., 2009) only protozoa were found in the assessed samples, these being *Entamoeba coli* in 8 children, *Giardia lamblia* in 1 child, *Iodamoeba butschilli* in 1 child and *Urbanorum* spp. in 2 children, similarly to what was found in the present work.

Even though the population assessed in the present study shows a high risk for contamination and infection with intestinal parasites, data showed 30% of stool samples contained parasites, most of these being *Entamoeba coli*, a protozoa considered commensal. A likely explanation for the low number of parasites detected is that children are tended to by local social services, which provides the assessed population with health and educational support. Another important factor is that more than half of the assessed children had taken anti-parasitic drugs prior to sample collection. Also, the children included in this study do have somewhat good hygiene habits, and washing hands is the first barrier in preventing parasite transmission through food (BANHOS *et al.*, 2017). Nowadays, health measures by agencies have also become decentralized in Brazil, increasing children access to anti-parasitic drugs, increasing overall life conditions.

High prevalence of intestinal parasitic diseases is a direct consequence of poor basic sanitation, including supply of clean water, collection of garbage residues, installation of sewage systems; environmental conditions, such as tropical climates, further aggravates the issue (RONDÓN, 2016). According to Rondón (2016), education is one of the most important mechanisms for combating infectious diseases, as people informed on hygiene measures are less likely to suffer from such diseases. Social services thus play an important role in health education, providing the general population with basic information on handwashing, cleaning of food and on how to treat children suffering from parasitic diseases, improving overall quality of life. Studies evidence that several educational tools can be used for health education, making easier to prevent and control intestinal parasitic diseases, as described in the study by Boeira *et al.* (2010). The importance of social actions in reducing the number of parasitic infectious diseases cannot be understated.

In the present work, there was a likely trend for statistical significance for the association between parasitic infections and male sex. This evidences cultural questions where boys, unlike girls, are usually stimulated to play and engage in outdoor activities, meaning they are more likely to come in contact with contaminated soil (SOARES *et al.*, 2016).

Another point worth mentioning is the complete absence of helminths in the studied population. Similar results were described by Fonseca *et al.* (2018), which reported in their studied population a prevalence of enteric parasitic diseases of 15.1% (13 children), all of which were caused by protozoa, especially *Giardia lamblia* and *Entamoeba coli.* The absence of helminths in the assessed samples might be justified by frequent use of antiparasitic drugs, children being oversaw by social services and overall, reasonably good hygiene habits.

The system utilized for collection of stool samples in this study (Paratest®) was also used in other works, such as in the one carried out by Barbosa *et al*. (2017), which show this system is sensitive enough to detect lower amounts of all types of eggs, larvae and cysts, besides conserving better stool samples, making further fixation of parasites into glass slides easier. The system does not require direct manipulation of samples, and is also environmentally safe, as its compounds are biodegradable and non-toxic.

A study published by Calais *et al.* (2018) reported assessing 80 samples obtained from the cities of Capela do Alto and Capivari utilizing the same system employed in the present work (spontaneous sedimentation) and comparing the results obtained with results obtained via classic Hoffman method. Results obtained by both methods were quite similar, which amounted to 5 positive cases, being found eggs and larvae of *Enterobius vermicularis* and cysts of *Giardia lamblia* in assessed samples. Thus, the method used in the present work most likely did not influence the final results obtained.

Giardia lamblia is transmitted mainly via oral-fecal routes, including ingestion of mature cysts transmitted due to consumption of untreated tap water and contaminated food (especially raw

vegetables and unwashed fruits); the latter can also be contaminated by cysts carried out by flies and cockroaches or transmitted by contaminated humans and domestic animals (RYAN *et al.*, 2018). This parasite is a flagellate protozoon which inhabits the intestines of infected human hosts, damaging the gut mucosa and leading to gastrointestinal disorders, especially diarrhea.

Iodamoeba butschilii is considered a commensal microorganism inhabiting the large intestine of humans. According to Iglesias-Osores e Failoc-Rojas (2018), this protozoon could even be used as a marker of oro-fecal contamination of water and food, as transmission routes are similar to those of other pathogenic protozoa. It is transmitted via ingestion of mature cysts found in contaminated water and food. It is more commonly found in adults, but can contaminate individuals of all ages (GALVÁN-RAMIREZ *et al.*, 2019).

Entamoeba coli, a type of amoeba, can be found in the large intestine of humans and animals, and is released to the environment via feces (SANTOS *et al.*, 2013). As happens with other protozoa, contamination also depends of ingestion of contaminated water and food (LIMA JUNIOR; KAISER; CATIST, 2013).

Urbanorum spp. was first discovered in the 1990 decade in Peru; it is also a protozoon very similar to amoebas and found in human feces (VILAFUERTE; COLLADO; VELARDE, 2016). To this day, however, the biology of this parasite is still not fully known. The first case of infection with this parasite in Brazil dates to 2018 in the state of Maranhão (KRUGER, 2020). Its transmission is similar to that of other intestinal parasites, taking place via contact with contaminated water and food. Clinical symptoms are also similar to those arising from infection with other parasites, involving diarrhea and intestinal cramps (AGUIAR; ALVES, 2018).

CONCLUSION

In the present study, the protozoon most commonly found in the assessed stool samples was *Entamoeba coli*, which can be considered a commensal parasite. Even though the assessed population is composed of vulnerable children, it does have access to basic health care and education provided by local social services. This ensures children are less likely to be contaminated via oro-fecal routes by enteric parasites.

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REFERENCES

AGUIAR, R. P. S.; ALVES, L. L. *Urbanorum* spp.: First report in Brazil. **American Journal of Case Reports**, v. 19, p. 486-490, 2018.

ANDRADE, A. O.; DE SÁ, A. R. N; BEZAGIO, R. C. Prevalência de parasitoses intestinais em crianças de um centro municipal de educação infantil de Campo Mourão, PR/Brasil. **Revista Uningá Review**, v. 29, n. 3, 2017.

ANTUNES, A. S.; SANTOS, B. L K. Prevalência de enteroparasitoses em crianças de creches do município de Santo Ângelo, RS. **Revista Contexto & Saúde**, v. 17, n. 32, 144–156, 2017.

ARAUJO FILHO, H. B. *et al*. Parasitoses intestinais se associam a menores índices de peso e estatura em escolares de baixo estrato socioeconômico. **Revista Paulista de Pediatria**, v. 29, n. 4, p. 521-528, 2011.

BANHOS, E. F. *et al*. Prevalence and risk factors for intestinal parasite infections in schoolchildren, in the city of Santarém, Pará State, Brazil. **ABCS Health Sciences**, v. 42, n. 3, p. 137-142, 2017.

BAPTISTA, S. C. *et al.* Análise da incidência de parasitoses intestinais no município de Paraíba do Sul, RJ. **Revista Brasileira de Análises Clínicas**, v. 38, n. 4, p. 271-273, 2006.

BARBOSA, J. Á. *et al*. Análise do perfil socioeconômico e da prevalência de enteroparasitoses em crianças com idade escolar em um município de Minas Gerais. **HU Revista**, v. 43, n. 4, p. 391-397, 2017.

BIANCHINI, R. A. *et al*. Enteroparasitoses: prevalência em centro de educação infantil na cidade de Maringá, Paraná, Brasil. **Revista Uningá Review**, v. 24, n. 3, p. 06-10, 2015.

BISCEGLI, T. S. *et al*. Estado nutricional e prevalência de enteroparasitoses em crianças matriculadas em creche. **Revista Paulista de Pediatria**, v. 27, n. 3, p. 289-295, 2009.

BOEIRA, V. L. *et al*. Educação em saúde como instrumento de controle de parasitoses intestinais em crianças. **Varia Scientia**, v. 9, n. 15, p. 35-43, 2010.

CALAIS, L. A. Avaliação de modelo de sedimentação rápida para exame protoparasitológico de fezes. **18.º Congresso Nacional de Iniciação Científica** 2018.

FERRAZ, R. R. N. *et al*. Parasitoses intestinais e baixos índices de Gini em Macapá (AP) e Timon (MA), Brasil. **Cadernos Saúde Coletiva**, v. 22, p. 173-176, 2014.

FERREIRA, H.; LALA, E. R. P.; MONTEIRO, M. C. Hospitalização de crianças causada por parasitoses intestinais e sua relação com desnutrição. **Revista da Sociedade Brasileira de Enfermeiros Pediatras**, v. 6, n. 1, p. 47-54, 2006.

FERREIRA, U. M.; FERREIRA, C. D. S.; MONTEIRO, C. A. Tendência secular das parasitoses intestinais na infância na cidade de São Paulo (1984-1996). **Revista de Saúde Pública**, v. 34, p. 73-82, 2000.

FONSECA, T. C. *et al*. Fatores associados às enteroparasitoses em crianças usuárias de creches comunitárias. **Revista Ciência & Saúde**, v. 11, n. 1, p. 33-40, 2018.

GALVÁN-RAMÍREZ, M. D. L. L. *et al*. Enteroparasitism and risk factors associated with clinical manifestations in children and adults of Jalisco state in western Mexico. **Osong Public Health and Research Perspectives**, v. 10, n. 1, p. 39-48, 2019.

IGLESIAS-OSORES, S.; FAILOC-ROJAS, V. *Iodamoeba bütschlii*. **Revista Chilena de Infectologia**, v. 35, n. 6, p. 669-670, 2018.

KRUGER, E. M. M. *Urbanorum* spp.: novo parasita no Brasil**. Revista Brasileira De Medicina De Família E Comunidade**, v. 15, n. 42, p. 2157, 2020.

LIMA JUNIOR, O. A. D.; KAISER, J.; CATISTI, R. High occurrence of giardiasis in children living on a'landless farm workers' settlement in Araras, São Paulo, Brazil. **Revista do Instituto de Medicina Tropical de São Paulo**, v. 55, n. 3, p. 185-188, 2013.

MANFROI, A.; STEIN, A. T.; CASTRO FILHO, E. D. Abordagem das Parasitoses Intestinais mais Prevalentes na Infância. **Associação Médica Brasileira e Conselho Federal de Medicina,** 2009.

MELO, E. M.; FERRAZ, F. N.; ALEIXO, D. L. Importância do estudo da prevalência de parasitos intestinais de crianças em idade escolar. **SaBios-Revista de Saúde e Biologia**, v. 5, n. 1, p. 43-47, 2010.

MOREIRA, A. S. *et al*. Pesquisa de parasitos intestinais em crianças de um centro de educação infantil em um município no sul de Minas Gerais. **Revista da Universidade Vale do Rio Verde**, v. 17, n. 1, 2019.

PERES, É. A. *et al*. Ocorrência de parasitos intestinais e intervenção educativa em uma escola estadual na cidade de Sorocaba. **Revista Eletrônica de Biologia**, v. 2, n. 4, p. 26-37, 2009.

PITTNER, E. *et al*. Enteroparasitoses em crianças de uma comunidade escolar na cidade de Guarapuava, PR. **Revista Salus**, v. 1, n. 1, p. 97-100, 2007.

RYAN, U. *et al*. *Giardia*: an under-reported foodborne parasite, **International Journal for Parasitology**, v. 49, n. 1, p. 1-11, 2018.

RONDÓN, Y. F. **Estratégia educativa para a redução do parasitismo intestinal na área de abrangência do PSF Ana Rosa, Bom Despacho, Minas Gerais**. 2016. 32f. Trabalho de Conclusão de Curso (Especialização em Atenção Básica) – Universidade Federal de Minas Gerais, Bom Despacho, 2016.

SANTOS, H. L. C. *et al*. LUMINEX®: a new technology for the simultaneous identification of five Entamoeba spp. commonly found in human stools. **Parasites & Vectors**, v. 6, n. 69, 2013.

SILVA, E. F. *et al*. Enteroparasitoses em crianças de áreas rurais do município de Coaris. **Revista de Patologia Tropical**, v. 38, n. 1, p. 35-44, 2009.

SILVA, J. C. *et al*. Parasitismo por Ascaris lumbricoides e seus aspectos epidemiológicos em crianças do Estado do Maranhão. **Revista da Sociedade Brasileira de Medicina Tropical**, v. 44, n. 1, p. 100-102, 2011.

SILVA, L. B. M. **Uma abordagem sobre as principais parasitoses intestinais mais prevalentes na infância e suas causas**. 2017. 63f. Trabalho de Conclusão de Curso (Bacharelado em Biomedicina) - Centro Universtário São Lucas, Porto Velho, 2017.

SILVA, M. C. M. *et al*. Determinação da infecção por *Entamoeba histolytica* em residentes da área metropolitana de Belém, Pará, Brasil, utilizando ensaio imunoenzimático (ELISA) para detecção de antígenos. **Cadernos de Saúde Pública**, v. 21, n. 3, p. 969-973, 2005.

SOARES, C. V. D. *et al*. Prevalência de enteroparasitoses em crianças de uma creche pública no município de Campina Grande. **Journal of Biology & Pharmacy and Agricultural Management**, v. 12, n. 4, p. 28-38, 2016.

VILLAFUERTE, R. I. M.; COLLADO, L. A. Z.; VELARDE, C. N. *Urbanorum* spp. en el Perú. **Revista Peruana de Medicina Experimental y Salud Pública**, v. 33, n. 3, p. 593-595, 2016.