

**Prevalence of intestinal parasites in the premises of the correctional institution****Prevalência de parasitas intestinais nas dependências de uma instituição prisional****Prevalencia de parásitos intestinales en las dependencias de una institución penitenciaria****Received: 05/09/2015****Approved: 04/07/2016****Published: 01/09/2016****Katymilla Guimarães Giroto**<sup>1</sup>**Amanda Ferreira Silva**<sup>2</sup>**Leiredayane Morais Silveira**<sup>3</sup>**Juliana Mendes Silva**<sup>4</sup>**Ceres Aparecida Vilela**<sup>5</sup>**Nawany Moura Daniel**<sup>6</sup>

This study aimed at determining the prevalence of intestinal parasites in various locations (canteen, toilets, water fountain and courtyard) of a correctional institution in a city of Goiás, Brazil. Samples were collected using a transparent adhesive tape (Scotch or Durex). The tape was used on the surface of each place investigated and subsequently placed on a slide for an analysis in the microscope. Slides were read by two examiners, directly in a common optical microscope, with their sized increased between 100 and 400 times. As a whole, 177 samples were collected, nine (5.1%) were positive for *Ascaris lumbricoides*, one (0.5%) for *acari* and another (0.5%) had a cyst of *Endolimax nana*. All positive slides with *Ascaris lumbricoides* were from the canteen (stove, fridge, counter, pot, vegetable basket, knife) and samples of *Endolimax nana* and *acari* were present in the toilet seats in the restrooms. Correctional institutions are considered to pose risks of contamination to those who are frequently there.

**Descriptors:** Parasites; Prisons; Hygiene; Food handling; Parasitology.

Este estudo teve como objetivo determinar a prevalência de parasitas intestinais em diversos locais (cantina, dos sanitários, do bebedouro e do pátio) de uma instituição prisional de uma cidade do interior de Goiás. As amostras foram coletadas utilizando uma fita adesiva transparente (tipo Durex ou Scotch), essa fita foi aplicada à superfície de cada local pesquisado e, posteriormente, recolocada sobre uma lâmina para a microscopia, as lâminas foram lidas por dois examinadores, diretamente, em microscopia óptica comum, em aumentos de 100 a 400 vezes. Ao todo, foram coletadas 177 amostras, sendo nove (5,1%) positivas para *Ascaris lumbricoides*, uma (0,5%) apresentou ácaro e outra (0,5%) apresentou cisto de *Endolimax nana*. Todas as lâminas positivas com *Ascaris lumbricoides* referiam-se à cantina (fogão, freezer, balcão, panela, cesto de verduras e, faca) e as amostras de *Endolimax nana* e ácaro estavam presentes nos sanitários (vasos sanitários). A instituição prisional analisada representa um local de risco para as pessoas que a frequentam.

**Descritores:** Parasitas; Prisões; Higiene; Manipulação de Alimentos, Parasitologia.

Este estudio tuvo como objetivo determinar la prevalencia de parásitos intestinales en diferentes lugares (la cantina, los sanitarios, la fuente de agua y el patio) de una institución penitenciaria de una ciudad de Goiás, Brasil. Las muestras se recogieron usando una cinta adhesiva transparente (Cinta Scotch o similares), esta cinta se aplicó a la superficie de cada lugar investigado y, posteriormente, sustituida en una lámina para la microscopía, estas fueron leídas por dos examinadores, directamente, en microscopía óptica común, en aumentos de 100 a 400 veces. En total, fueron colectadas 177 muestras, nueve (5.1%) fueron positivas para *Ascaris lumbricoides*, una (0,5%) presentó ácaros y otra (0,5%) tenía un quiste de *Endolimax nana*. Todas las láminas positivas con *Ascaris lumbricoides* se encontraban en la cantina (cocina, congelador, mesada, una olla, cesta de verduras y, un cuchillo) y las muestras de *Endolimax nana* y ácaro estaban presentes en los sanitarios (inodoros). Se concluye que la institución penitenciaria representa un lugar de riesgo para las personas que se encuentran en ella o la visitan.

**Descriptores:** Parásitos; Prisiones; Higiene; Manipulación de alimentos, Parasitología.

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## INTRODUCTION

Enteroparasitoses are serious public health problems that still persist in developing countries. Intestinal parasitoses in Brazil have shown that there is a lack of health education policies.

The eradication of these parasites requires improvements of basic sanitation and health education initiatives, in addition to the changes in certain cultural habits<sup>1</sup>. Intestinal parasitoses are among the most serious public health problems to affect humans, when we consider the high prevalence rates of both helminths and protozoa, which threaten the lives of the population of the world<sup>2</sup>. To this end, researches conducted in Latin America and Asia show that hookworms, amebiasis and giardiasis were among the 20 most fatal infections, with a high morbidity rate<sup>3</sup>.

The high prevalence of intestinal parasitic infections reflects a deficiency in sanitation, hygienic behaviors and the existence of favorable ecological factors. Also, one of the key factors to fight infectious diseases is education, as people with more information regarding hygiene are under a smaller risk of contracting them. Health education is, without doubt, the most efficient preventive measure<sup>3</sup>.

Health education involves the implementation and evaluation of programs which count on the participation of the people themselves to solve the problems that infectious diseases bring upon them<sup>2</sup>. That being so, teachers point their efforts in the direction of people who, in order to face their problems, must act as subjects of their own lives, and as such, be aware of the larger social context they are involved in<sup>4</sup>. Trying to combat infectious diseases by radically changing traditional habits of the affected populations is not the most suitable type of action. On the contrary, it is necessary to maintain the populations' habits, while offering alternatives that can work around the problem and keeping the value which certain behaviors have for the individuals<sup>5</sup>.

The transmission of intestinal parasitoses occurs, in most cases, through oral ingestion of contaminated water or food. The main source of intestinal parasite infections in humans can be found in the soil and water, being that humans themselves are partially responsible for the contamination of the environment. Feces are the source of dissemination of intestinal parasitoses.

In this complicated universe, the community (adults, adolescents or children) represents the most important link in the ecosystem in which these parasites live<sup>6</sup>. Several potential sources of infection by intestinal parasitoses have been identified, being the food handlers one of the most relevant ones<sup>7, 8</sup>. Food handlers play a considerable role in the spreading of diseases transmitted by food, and therefore, an improvement in food security must include adequate education regarding sanitizing, and periodic stool tests of these professionals, especially in areas in which these infections have proven to be endemic<sup>8</sup>.

The highest prevalence of these infections is in areas that present precarious sanitary and hygienic conditions, linked to the lack of adequate water and sewage treatment. These elements make the spread of eggs, larvae and cysts easier, and that is further facilitated when the contact between people is increased, as happens in closed spaces, such as kindergartens, schools, asylums and prisons. In these environments, the large number of individuals frequently does not allow for them to obey hygiene standards, contributing to the high degree of intestinal parasite infections<sup>9</sup>.

The age group that intestinal parasites affect the most are children between 3 and 6 years of age. In spite of that, the group of kids between 6 and 9 years old still has a high rate of infections – although it already presents a tendency to decrease. Frequencies are relatively low for people with more than 18 years of age<sup>1</sup>. In the elderly, intestinal parasites can become serious problems, considering that among that population one

can find high levels of malnutrition, besides morphological, physiological and immunological changes, which contribute for the development of chronic and auto-immune diseases, together with neoplasias, all of which provoke a high rate of morbidities and mortality<sup>10-14</sup>. In addition, it is known that infectious and/or parasitic diseases in the elderly happen mostly due to the aging of the immune system<sup>15,16</sup>.

The parasites that may be present in prisons are the intestinal protozoa belonging to the genera *Giardia*, *Cryptosporidium* and *Entamoeba*, pathogens that together with some bacteria and viruses, are part of a complex group of diarrheal diseases, which may even lead the individual to death.

These parasites have in common the ease with which they can be transmitted through water and food, besides being intimately connected to poor conditions and lack of basic sanitation. It should be emphasized that the *Giardia* and the *Cryptosporidium* are parasites that pose a great danger to public health, as they have zoonotic potential. Regarding helminths, flatworms such as the *Schistosoma mansoni* and the *Taenia* sp, and the nematodes, such as the hookworms and the *Ascaris Lumbricoides* are also relevant to public health, and are parasites which can be disseminated among people who are in crowded places, such as correctional institutions.

About a quarter of the people in the world are hosts to one or more species of intestinal nematodes, among which the *Ascaris Lumbricoides* is the most common<sup>17</sup>. For all those reasons, this study aimed at determining the prevalence of intestinal parasites in several places (canteen, bathrooms, water fountains and courtyard) inside a correctional institution in a city in the countryside of Goiás.

## METHOD

This study was conducted in a correctional institution of a town located in the mesoregion south of Goiás, microregion Meia Ponte, in the

State of Goiás, Brazil. The municipality of this research has an area of 2,461,280 Km<sup>2</sup>, tropical climate, and is at an altitude of 448m. The city has a population of 91,892 inhabitants and the water and sewage are treated by SANEAGO. The prison occupies a total area of 387,000 m<sup>2</sup>, among which are 382,000 m<sup>2</sup> of cultivable area, eight acres of environmental preservation area, and 4,800m<sup>2</sup> of constructed area.

The prison has a capacity for 252 inmates, in two different buildings (each with two wings), and is built upon pilots (pillars). The structure also contains five classrooms, a living center, and rooms for various services and consultations.

The prison is characterized as a "Respect Ward", in which inmates are separated according to the crime they committed, their behavior and interest in the activities developed inside the facility, such as study, professionalization and work. Along the 382,000m<sup>2</sup> of arable land, there is a prison garden, not to mention breedings of cattle, fish, pigs and others. The idea behind that strategy is so that the prisoners can produce the food which will be eaten at the correctional facility. That gives them an occupation which can be used professionally in the future, diminishes the amount the facility spends, and makes it self-sufficient.

To check for the contamination of the prison environment, samples were collected in different places inside the facility, such as: canteen, bathrooms, courtyard, drinking fountain, school, and cells.

The samples were collected with the use of a transparent adhesive tape (Durex or Scotch)<sup>18</sup>. This method consists in placing, lengthwise, on a microscopic glass slide, a 8-10 cm long duct tape, with 1 cm folds at both ends for easy handling. This tape was used in the surface of each researched place, and later, placed upon a microscope slide. The slides, after collection, were properly tagged in one of their extremities. The tag contained the name of the place from where they were taken. They were then enveloped individually in toilet

paper. After that, they were placed inside a Styrofoam container, and sent to the lab at ILES/ULBRA. If the blades were not to be examined immediately, they were kept in a fridge, properly packed in aluminum foil.

The slides were analyzed by two examiners, on a simple optical microscope (Olympus, CH-2, Japan), with zooms varying between 100 and 400 times. The results of the analyses were noted in individual sheets for each place in the research. The slides which were positive for the presence of intestinal parasites were photographed with the use of a digital camera (Sony, 6.0 Mega Pixels, Brazil), on a simple optical microscope.

After the parasitological diagnosis, the results have been sent to all those responsible for the correctional institution, so that they could inform the inmates and workers about the actual situation regarding the contamination of their environment.

This study does not present any risks for its population, as the exams were conducted only upon the environment in which the inmates live. The responsible for the prison has authorized, in the institution itself, for this work to be conducted there.

## RESULTS

As a whole, 177 samples were collected from the several sites analyzed. Nine samples (5.1%) were positive for *Ascaris lumbricoides*, one (0.5%) presented acari and another (0.5%), presented cysts of *Endolimax nana*.

All the slides positive for *Ascaris lumbricoides* belonged to the canteen (stove, fridge, counter, pot, vegetable basket, knife) and the samples positive for *Endolimax nana* and acari were present in the toilet seats in the restrooms (Figures 1 to 3).

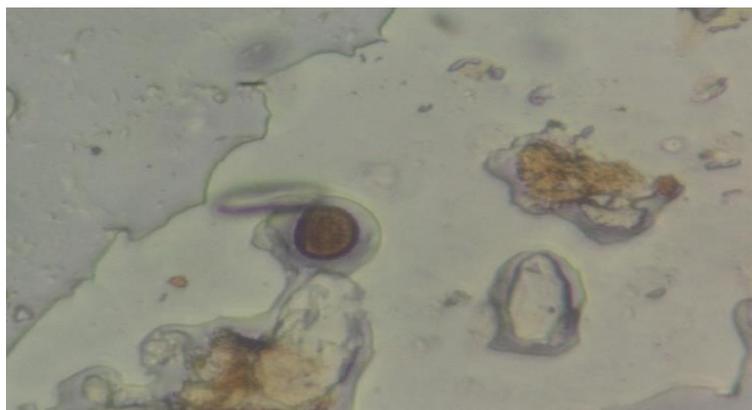
**Figure 1.** Egg of *Ascaris lumbricoides*.



**Figure 2.** *Endolimax nana* cyst



**Figure 3:** Egg of *Ascaris lumbricoides*



## DISCUSSION

Some acari are parasites, but others, commonly found in the environment, are responsible for causing allergic and respiratory diseases. That happens when acari are suspended in the air together with dust, and are inhaled by individuals who then develop hypersensitive reactions<sup>19</sup>. The eggs of *Ascaris lumbricoides* are very capable of adhering to surfaces, which is an important factor in the transmission of parasites, since these eggs are not easily removed by washing the place their in<sup>20</sup>.

In the field of Parasitology, there is an absence of programs focused on prisons and a precarious epidemiological framework. Epidemiological surveys covering the occurrence of intestinal parasitoses are routinely performed in children, due to the understanding of their habits and characteristics that make the transmission of several parasitic diseases easier. Therefore, little is known regarding the occurrence of these diseases in correctional institutions.

The only study to this end that could be found was conducted in Presidente Venceslau-SP<sup>1</sup>, where the researchers observed that intestinal parasites were present in 33.3% of the inmates, being the hookworm the most common (16.13%), followed by the protozoa *Giardia duodenalis* (9.78%).

Not only prisons, but other places, such as public bathrooms, buses, schools/nurseries, and Long Permanence Institutions for the Elderly (LPIE) can be places where intestinal parasites are able to easily spread and contaminate people.

Recent global studies have shown that the prevalence of helminths transmitted through the soil in public schools can vary from 40% to 80%, rates much higher than those in the prison environment<sup>21</sup>. Another study in a school environment<sup>22</sup> showed that among school-age children there was a prevalence of 11.2% of *Schistosoma mansoni*, 19.2% of *Ascaris lumbricoides* and 0.5% of *Taenia* sp., restating the presence of helminths in crowded environments. Another research<sup>23</sup> also found high prevalence of helminths such

as *Ascaris lumbricoides* (20.6%) and *Schistosoma mansoni* (24.8%) in children who are school-age.

In another research<sup>24</sup>, the prevalence of intestinal parasites in a school environment was 3.3% of *Ascaris lumbricoides* in the first analysis, whereas in the second this number was increased to 10.0%, with the introduction of other parasites such as the *Enterobius vermicularis*, corroborating this study.

Regarding the LPIEs, a study<sup>25</sup> found a 7.5% rate of positive results for *Strongyloides stercoralis*, and another<sup>26</sup> showed that 12.8% of seniors surveyed were positive for intestinal parasites, including protozoans and helminths, restating the concerns about possible horizontal transmission among seniors, food handlers and health care professionals who work in these places.

Other studies also showed that 6.25% of the toilet seats examined in the city of Uberlândia-MG were contaminated with eggs of *Ascaris Lumbricoides* and *Enterobius vermicularis*, not to mention that 18.7% of the buses were contaminated with *Enterobius vermicularis*<sup>27</sup>. This findings corroborate this study, considering that the same parasite (*Ascaris Lumbricoides*) was found. However, the prevalence in the toilet seats and the buses was superior to that of the correctional facility.

In a research<sup>28</sup> aimed at finding the prevalence of intestinal parasites in toilet seats, the results were very similar to those found in the prison environment, being that in both studies the same methods were used, and *Ascaris Lumbricoides* was found. Another investigation<sup>29</sup> had similar results to those of the correctional institution, being that the most common parasite found in toilet seats, with the use of the adhesive tape method, was also the *Ascaris Lumbricoides*.

## CONCLUSION

The studies mentioned above show that it is common to find eggs of intestinal parasites in crowded places, which can contribute to an

increased rate of contamination of the individuals who live in these places.

Thus, it is extremely important to implement public policies aimed at informing the population about the types of intestinal parasites that may be present in their environment, their forms of transmission, as well as prophylactic measures to prevent from being affected by them. It is through these actions that it is possible to decrease the spread of intestinal parasites.

Regarding correctional facilities, there are too few studies. Therefore, other studies in institutions of this kind, as well as the use of their results for interventions regarding hygiene and hygiene habits become necessary.

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#### CONTRIBUTIONS

**Katymilla Guimarães Giroto** was responsible for the conception of the research, its design, sample collection, analysis and data interpretation, and writing the article. **Amanda Ferreira Silva, Leiredayane Moraes da Silveira, Juliana Mendes da Silva, Ceres Aparecida Vilela e Nawany de Moura Daniel** participated in the collection, analysis and interpretation of samples.

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