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# Intestinal parasites among employees of restaurants and cafeterias in a city of Brazil

## Parásitos intestinales entre los empleados de restaurantes y cafeterías en una ciudad de Brasil

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### ABSTRACT

**Objective** To investigate the frequency of intestinal parasites in employees of restaurants and cafeterias located in the Commercial Center of São Mateus, Espírito Santo, one of the oldest cities of Brazil.

**Material and Methods** Between August 2013 and February 2014, 42 fecal samples were collected and analyzed by spontaneous sedimentation method in the Clinical Analysis Laboratory of the Federal University of Espírito Santo, São Mateus Campus.

**Results** The results were positive in 19 % of the samples. The commensal *Entamoeba coli* (75 %) was the most common followed by *Entamoeba histolytica/dispar* (37.5 %) and *Giardia lamblia* (12.5 %).

**Conclusions** Implementing health education measures in the city of São Mateus is suggested by providing permanent health education, as well as conducting parasitological examinations. Such actions will contribute to the improvement of health conditions of the population.

**Keywords:** Food parasitology; food handling; incidence (source: MeSH, NLM).

### RESUMEN

**Objetivo** Investigar la frecuencia de parásitos intestinales en empleados de restaurantes y cafeterías ubicadas en el Centro Comercial de São Mateus, Espírito Santo, una de las ciudades más antiguas de Brasil.

**Materiales y Métodos** Entre agosto de 2013 y febrero de 2014, 42 muestras fecales fueron recolectadas y analizadas por el método de Sedimentación Espontánea en el Laboratorio de Análisis Clínicos de la Universidad Federal de Espírito Santo, campus de São Mateus.

**Resultados** Los resultados fueron positivos en el 19 % de las muestras, y el comensal más frecuente fue *Entamoeba coli* (75 %), seguido de los parásitos *Entamoeba histolytica/dispar* (37,5 %) y *Giardia lamblia* (12,5 %).

**Conclusión** Se sugiere la necesidad de adoptar medidas de educación sanitaria para la ciudad de São Mateus, dando charlas permanentes sobre orientación sanitaria y realizando exámenes parasitológicos. Estas acciones contribuirán a la mejora de las condiciones de salud de la población.

**Palabras Clave:** Parasitología de alimentos, manipulación de alimentos, incidencia (fuente: DeCS BIREME).

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Intestinal parasites, also known as enteroparasites, are caused by organisms of the phyla *Protozoa*, *Platyhelminthes*, *Nematoda* and *Acantocephala*. Enteroparasites are a major public health issue, with individual and social consequences such as deficiencies in school and work performance, as well as expenses for health services (1,2).

They are transmitted orally by ingesting water or contaminated food and, therefore, they are more common in areas where sanitary conditions are inadequate (3). In 2014, the United Nations Food and Agriculture Organization (4) listed the 10 main parasites found in food products, especially *Taenia solium* in pork, *Echinococcus granulosus* and *Entamoeba histolytica* in fresh products and *Trypanosoma cruzi* in fruit juices. It is estimated that millions of individuals around the world are affected by foodborne illnesses due to the deficiency or absence of a hygienic control of products, handlers and traders (5,6,7).

Considering food as an important means for the transmission of enteroparasites, it is important to emphasize that asymptomatic individuals, particularly those who work in contact with food, can be a source of dissemination of enteroparasites, besides other pathogens. (1,8) Studies conducted by Nolla & Cantos (9) with food handlers in Florianópolis, Santa Catarina, Genuíno (8) in João Pessoa and Paraíba & Dias (10) in the island of São Vicente, Cape Verde, Africa, showed that the most common intestinal parasites observed in this population were *Endolimax nana*, *Entamoeba coli*, *Enterobius vermicularis* and *Strongyloides stercoralis*. In addition, *Giardia lamblia* and *Hymenolepis nana* also showed a significant frequency in food handlers from Porto Alegre, in Rio Grande do Sul (11).

*E. nana* and *E. coli* are amoeba species classified as commensal *protozoa*, whose transmission occurs by the ingestion of cysts in contaminated water and food. In cases of pure infections, they are capable of causing abdominal pain, diarrhea, flatulence, vomiting and fatigue, without major complications (12,13). On the other hand, *G. lamblia*, *E. vermicularis*, *S. stercoralis* and *H. nana* can trigger more severe clinical manifestations in infected individuals (13).

*G. lamblia* is transmitted by the ingestion of parasitic cysts, and can be transferred by food handlers by direct contact (anal-oral), as well as by the consumption of contaminated water, vegetables and fruits. (14) Infections by this parasite range from asymptomatic forms to infections with chronic diarrhea, accompanied by steatorrhea, weight loss and intestinal malabsorption (13,15). Abdominal pain and diarrhea accompanied by distension are also observed in the acute form (16).

*E. vermicularis* has a direct form of contamination — anal-oral ingestion of eggs — and an indirect form — ingestion of eggs through food or dust aspiration (13,17). It causes intense anal pruritus in the individual, which exacerbates at night due to the movement of the parasite as a consequence of the heat of the bed. Patients usually present with nausea, vomiting, abdominal cramps, tenesmus and, more rarely, bloody evacuations. In women, vulvar

pruritus, vulvovaginitis, vaginal discharge and urinary infection may occur (13,16).

*S. stercoralis* is the etiologic agent of strongyloidiasis, a chronic disease of the gastrointestinal tract, usually asymptomatic. However, in massive infections, abdominal or epigastric pain, anorexia, nausea, vomiting, weight loss, secretory diarrhea or steatorrhea and protein-calorie malnutrition can be observed. Individuals with compromised immune systems are severely affected, resulting in hyperinfection and disseminated forms of strongyloidiasis, responsible for a high mortality rate due to its difficult recognition (13,18).

*H. nana* affects mainly children and young adults. Transmission can occur by ingesting eggs from contaminated hands or foods (19,20) and most patients develop the asymptomatic form of the infection. However, symptoms are related to the increasing age of the patient and parasite load, and may include abdominal cramps, nausea, vomiting, anorexia, weight loss, diarrhea, restlessness, insomnia, dizziness, seizures, epileptic seizures and allergies (13,19).

Considering that food handlers are facilitators of parasite transmission through food and that studies in this regard have not been conducted in São Mateus, one of the main cities in the state of Espírito Santo-Brazil, the objective of this study was to investigate the frequency of intestinal parasites in employees of restaurants and cafeterias located in the Commercial Center of the city.

## MATERIAL AND METHODS

### Study location

This study was conducted in the municipality of São Mateus, colonized by the Portuguese in 1544 and located on the coast of Espírito Santo. It has a population of 109 028 inhabitants spread over an area of 2 338 727km<sup>2</sup>, with a population density of 46.62 inhabitants/km<sup>2</sup> and human development index (HDI) of 0.735 (21,22).

### Study and sample characterization

This is a descriptive cross-sectional study with a qualitative and quantitative approach to enteroparasite frequency in employees of restaurants and cafeterias of the Commercial Center of São Mateus.

Fecal samples of employees in 20 food establishments (restaurants and cafeterias) were collected between August 2013 and February 2014.

### Research tool

A questionnaire was used to describe the profile of the studied sample, and the following indicators were analyzed: age, sex, place of residence (center/periphery), occupa-

tion in the food establishment, educational attainment and period of the last parasitological fecal examination.

### Collection and analysis of samples

Fecal samples were collected and placed in plastic containers, properly identified with the names of the participants and the establishment where they work. Samples were sent to the Clinical Analysis Laboratory of the Federal University of Espírito Santo, São Mateus Campus. The analysis was performed using the spontaneous sedimentation method (23) in order to verify the presence of *protozoan* cysts, helminth eggs and larvae. Three slides were prepared from each fecal sample and Lugol was used for staining. The analysis was performed by light microscopy, with magnifications of 100x and 400x for visualization and confirmation of parasitic forms. The results were delivered to the employees of the establishments as an individualized and confidential reports.

### Result analysis

The database generated by the questionnaire was systematized using Microsoft Excel 2007 and data were analyzed using the software STATA, version 12.0. Initially, descriptive analyses of the studied variables were performed to characterize the population, and the results were organized in tables and graphs.

Later, univariate analyses between the independent variables “place of residence (center/periphery)”, “sex”, “education”, “occupation” and “period of the last parasitological examination”, as well as the dependent variable “presence of parasites”, were performed using Pearson chi-square test.  $P < 0.20$  was considered significant. Successive multivariate analyses were subsequently performed by Poisson regression between the dependent variable and the independent variables with significant  $p$  values, and variables with  $p$  values higher than 0.05. Confidence intervals at 95 % were excluded.

### Ethical aspects

This study was approved by the Research Ethics Committee of CEUNES/UFES (No. 32929213.2.0000.5063) after the participants agreed to participate in it, which was confirmed by signing a free and informed consent form (FIC).

## RESULTS

Samples from 20 commercial establishments were analyzed, of which 5 (25 %) had employees with some intestinal parasitosis. In total, 42 individuals participated in the survey, and eight of them (19 %) were positive for parasitic forms (Table 1).

**Table 1.** Commercial establishments and employees infected by enteroparasites in São Mateus, ES, in 2014

Variable	Commercial establishments (n=20)		Employees (n=42)	
	N	%	N	%
Positive for enteroparasites	5	25	8	19
Negative for enteroparasites	15	75	34	81

Source: Own elaboration based on the data obtained in the study.

Of the total participants, 23 (54.76 %) were females and 19 (45.24 %) males and, from eight positive samples, six (75 %) were females.

Among the parasites found, a higher frequency of the commensal *E. coli* was observed in 75 % of the cases. The age group with the highest number of positive individuals—females— was between 19 and 29 years old; among men, the most prevalent age group was between 30 and 39 years old (Table 2).

The occurrence of polyparasitism is worth mentioning since the association of *E. coli* and *E. histolytica/dispar* was found in two of the eight positive samples.

**Table 2.** Positive results for enteroparasites according to sex and age group in employees of food establishments of São Mateus, ES, in 2014

Female	Positive samples	Parasites	Male	Positive samples	Parasites
Age group	N (%)		Age group	N (%)	
19-29	5 (41.7)	Ec, Ec, Ec, Ec + Ehd, Ehd	19-29	2 (33.3)	GI, Ec
30-39	1 (25)	Ec + Ehd	30-39	0	
40-49	0	-	40-49	0	
50-59	0	-	50-59	0	

Ec: *Entamoeba coli*; Ehd: *Entamoeba histolytica/dispar*; GI: *Giardia lamblia*

Source: Own elaboration based on the data obtained in the study

Regarding educational attainment and frequency of parasitic contamination, it was found that most of the infected population (seven individuals) had completed secondary education (Table 3).

**Table 3.** Frequency of contamination with enteroparasites according to educational attainment in employees of food establishments in São Mateus, ES, in 2014

Variable	Infected		Not infected	
	N	%	N	%
Elementary School	1	12.5	18	52.9
Secondary Education	7	87.5	11	32.3
Technical Education	-	-	2	5.9
Higher Education	-	-	2	5.9
Did not answer	-	-	1	3.0

Source: Own elaboration based on the data obtained in the study

In relation to the occupation of infected individuals, waiters and housekeeping staff showed the highest number of positive samples (37.5 %), followed by managers and cooks (12.5 %).

Routine parasitological examinations revealed that 3 (37.5 %) infected individuals underwent stool culture

examination less than six months before the study, and other 3 individuals (37.5 %) between one and two years before. The remaining participants (25 %) underwent the examination more than three years before.

Regarding the responses from employees of food establishments on the results of parasitological examinations carried out over the last few years, 61.9 % said that they were negative, 28.6 % that they were positive and 9.5 % did not remember the result.

Out of the eight infected individuals, five lived in the periphery (Litorâneo, Morada do Ribeirão, Santo Antônio, Porto and Aroeira residence neighborhoods) and three in the downtown area (Centro, Boa Vista and Serrambi).

The Pearson chi-square test pointed to the dependent variable “presence of parasites” and significance for the independent variable “place of residence (center/periphery)” ( $p=0.005$ ), while Poisson regression for this variable showed a prevalence ratio (PR) of 2.70 ( $p=0.040$ ,  $CI=1.04-6.97$ ) for the periphery. The other independent variables were not significant in the model.

## DISCUSSION

The infection rate observed in the present study was small when compared to other parasitological surveys, such as those conducted in Florianópolis, SC (9), which identified enteroparasites in 42.8 % of food handlers; in João Pessoa, PB (24), which found a contamination rate of 52 %; and in Parnaíba, Piauí (25), which found 51 % of positive samples in food handlers. Nevertheless, the results found in São Mateus cannot be underestimated, given that 19 % of food handlers were contaminated.

After analyzing the sex of the infected individuals, it was observed that the amount of infected women was higher, as reported in studies in Florianópolis and João Pessoa (9,24). On the other hand, studies conducted in Parnaíba, Piauí (25) showed more positive samples in males. Indeed, it is plausible to consider that men are less concerned with hygiene issues (26) and, therefore, with an increasing number of males working in food areas which used to be predominantly female, it is possible to speculate a higher possibility of finding infected men and, consequently, a greater potential for disease transmission. Still, it is important to emphasize that all infected individuals in this study were aged between 19 and 39 years, a period of high productivity in life (27). Besides the possibility of parasite transmission to other individuals, such fact may be reflected on professional performance, resulting in losses for employers (28).

Regarding the parasitic species found in São Mateus, *E. coli* was the most frequent (75 %), which coincides with Reis & Carneiro (1) in food handlers from Morrin-

hos, GO, whose results indicated 62.5 % contamination by this parasite. Although it is not considered a pathogenic microorganism, its presence is important, since it may indicate fecal contamination in food and, consequently, poor sanitary conditions (24,25).

The infection rate for *E. histolytica/dispar*, although small when compared to *E. coli*, requires public attention, since it is a parasite that is easily transmitted by food and is able of inducing more severe clinical conditions. In fact, according to the Guidelines for Integrated Surveillance, Prevention and Control of Foodborne Diseases (Manual Integrado de Vigilância, Prevenção e Controle de Doenças Transmitidas por Alimentos), amoebic dysentery outbreaks may be mainly related to the presence of pathogenic strains of *E. histolytica* in contaminated food, thus reflecting the importance of this parasite (24,29).

A frequency of 12.5 % for *G. lamblia* is small when compared to the study conducted by Wingert & Araújo (11) in Porto Alegre, RS, who found an infection rate of 40 % in individuals working in supermarkets. The lowest frequency of *G. lamblia* observed in São Mateus is probably related to the fact that infected individuals are older and the scientific literature shows that this parasite is most common in children aged between 0 and 5 years (30).

Whereas one of the transmission mechanisms of enteroparasites is the ingestion of parasitic forms through food, water and objects contaminated with infected feces, and that the parasites found in the studied population —*G. lamblia*, *E. coli* and *E. histolytica/dispar*— are limited to this type of oral transmission, it is possible to predict that one of the factors that contributes to the transmission of these *protozoa* is inadequate practice of personal and domestic hygiene. In this context, improper handwashing and the lack of good hygiene practices by food handlers would cause food contamination, making them potential sources of parasite transmission (1,31,32).

Regarding educational attainment in food handlers, Nolla & Cantos (33) and Basso *et al.* (34) reported that this variable is one of the causes that contributes to the increased frequency of intestinal parasites in populations. In fact, studies indicate that less educated people show higher rates of parasitism, and this was also observed in São Mateus. In addition, the place of residence (center/periphery) of these workers may also contribute to the occurrence of parasitic diseases, since inadequate housing and sanitation are important factors in the distribution of the disease (34). In this study, these factors could be observed through the prevalence ratio, where workers living in the periphery showed an increase of 2.70 ( $p=0.040$ ,  $CI=1.04-6.97$ ).

Regarding the occupation of infected individuals, waiters and housekeeping staff were the most contaminated.



Actually, these professionals can act indirectly on the transmission of enteroparasites by contact with utensils (plates, cups, cutlery, etc.) or even food for customers, if they do not perform proper hand washing after using the restroom (28).

In general, when analyzing the frequency of parasitological examinations in the population, it was reported (11) that it is of paramount importance for health care, especially among food handlers, since it allows the detection and prevention of some endemic diseases, and leads the individual to maintain their personal and collective physical integrity. This study revealed that only 37.5 % of infected individuals had undergone routine examinations in the past six months and 28.6 % of them reported positive results. In this context, it is worth noting that the culture of not taking parasitological exams periodically is a concern for public health, since many people believe that helminthiasis do not require treatment or that they are part of our body as commensal beings. (35).

It is also important to emphasize that, in disease epidemiology, individuals who live in remote and periphery regions are more likely to develop parasitic diseases, among others, since these regions are marked by a precarious sanitary scenario (35,36). In São Mateus, it was not observed, given that each infected individual lived in a different neighborhood, even in remote areas of the city.

Finally, considering the importance of parasitic diseases in the public health context, it is necessary to implement health education measures and periodic parasitological examinations for food establishment employees in order to correct the flaws in health care and, consequently, reduce the risk of food contamination in these establishments, thus protecting the consumers ➤

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