Parasitological analysis from water reservoirs used for food irrigation in Vale Verde district (Minas Gerais, Brazil)

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Resumo

Este estudo objetivou analisar o conteúdo parasitológico em seis reservatórios de água usados para irrigação de alimentos no distrito de Vale Verde, Minas Gerais, Brasil, buscando ovos dos parasitas intestinais *Ascaris lumbricoides* e *Enterobius vermiculares*, além de cistos de *Entamoeba histolytica* e *Giardia lamblia*. De 10 a 13 de novembro de 2015, amostras de água (n = 36) foram coletadas em seis reservatórios no distrito de Vale Verde e analisadas em microscópio óptico quanto à presença dos parasitas alvos do estudo. Parasitas em forma de ovos ou cistos foram encontrados, especialmente *E. histolytica*, *A. lumbricoides* e *E. vermicularis*. Também foi possível visualizar outras estruturas parasitárias, como larvas, cistos e ovos. Assim, uma variedade de parasitas foi identificada em amostras de água dos reservatórios, as quais podem ser consideradas inadequadas para a irrigação de alimentos.
Palavras chaves: Abastecimento de água, parasitas, saúde pública.

Abstract

This study aimed to analyze the parasitological content in six water reservoirs used for food irrigation in Vale Verde district, Minas Gerais, Brazil, searching for eggs from the intestinal parasites *Ascaris lumbricoides* and *Enterobius vermicularis*, as well as *Entamoeba histolytica* and *Giardia lamblia* cysts. From 10 to 13 November 2015, samples of water (n=36) were collected from six reservoirs of Vale Verde district and analyzed for their parasitological quality on optical microscope. Parasites in form of eggs or cysts were found, particularly *E. histolytica*, *A. lumbricoides* and *E. vermicularis*. It was also possible to visualize other parasitic structures, such as larvae, cysts and eggs. Thus, a variety of parasites have been identified in water samples from the reservoirs, which may be considered unsuitable for food irrigation.
key words: Water supply, parasites, public health.

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The irrigation of vegetables and other food is a crucial step for the growth of a desirable food crop. The agriculture spends approximately 70% of the water available for consumption (MACEDO, 2007), being the sector with the largest water requirement. Moreover, the marketing of fresh food is quite wide and the consumption of vegetables is essential to human health as source of minerals in food (HANIF et al., 2006).

In the agriculture, the water used for irrigation sometimes comes from artificial reservoirs, which are made for storing the water coming from rainfall, rivers, ponds and streams. In this context, a large number of infectious diseases are related to water and by different transmission via; so evaluating the quality of irrigation water is of great importance to guarantee the safety of food to consumers (KPODA et al., 2015).

According to World Health Organization, the quality of reusable water needs to be monitored and the contents of protozoan cysts and helminth eggs must be evaluated (WHO, 2006). A water source with high parasite load can interfere with the integrity of the food irrigated and, moreover, some groups of people (farmers, consumers and local population) are at greater risk of parasitic infection related to the use of contaminated water (HAJJAMI et al., 2013; KPODA et al., 2015).

Some previous studies showed the potential contamination risks in freshly eaten food by parasites linked to quality of irrigation water (HASSAN et al., 2012; COBBINA et al., 2013; KPODA et al., 2015). In previous work, the microbiological and parasitological contents of water from shallow wells in Vale Verde district (Minas Gerais, Brazil) were analyzed and showed bacterial and parasitic contamination, especially *Entamoeba histolytica*, *Giardia lamblia* and *Entamoeba coli* (SILVA et al., 2015).

For this reason, the main objective of this study was to analyze the parasitological viewpoint of six reservoirs used for food irrigation, located in Vale Verde District, belonging to Ipaba city, Minas Gerais, Brazil. Parasites species found in the samples were identified as *Ascaris lumbricoides*, *Enterobius vermicularis*, *Entamoeba histolytica* or *Giardia lamblia*.

Sample collection

Samples were collected during the period extends from 10 to 13 November 2015 at six water reservoirs (1-6) used for food irrigation in Vale Verde district, Minas Gerais, Brazil. The geographic coordinates of the water reservoirs were 19°27'38"S 42°21'6"W (1), 19°26'53"S 42°21'37"W (2), 19°28'18"S 42°20'58"W (3), 19°26'49"S 42°21'56"W (4), 19°26'47"S 42°20'29"W (5) and 19°26'59"S 42°21'15"W (6). A total of 36 water samples were collected during the morning, and six samples of each reservoir. An amount of 50 mL of each sample were collected in tubes for biological materials, transported in chilled styrofoam box and transfer to the Cytology and Histology Laboratory of Faculdade Única de Ipatinga for further analysis.

Parasitological analysis

All the samples were left spontaneously sedimenting in cups according to coproparasitological technique of Hoffman, Pons and Janer (1934) (WHO, 2011). Using a Pasteur pipette, 10 mL of the precipitate were removed from the spontaneous sedimentation, centrifuged during 10 minutes at 2500 rpm on the Quimis Q222T2016 centrifuge, according to the technique of Faust et al. (1938). In the active search of parasites, glass slides were prepared for Quimis Q708-4 optical microscope, viewing in the 10x and 40x lenses. The parasitological identification was carried out according to the morphology of the eggs and cysts of the parasites, comparing with literature (WHO, 1994).

Visually, the water samples presented a degree of turbidity varied and colors changing from hyaline to shades of yellow. On microscope analysis, an abundant microbial flora was observed in the water samples, presenting various forms of bacteria (cocci, bacilli and spirochete), fungi (septate and non-septate),

Table 1: *Parasites in water analyzed by optical microscope*

Water reservoir	Parasites identified	Other parasites?
1	*Ascaris lumbricoides* *Entamoeba histolytica* *Enterobius vermicularis*	*Yes**
2	-	*Yes**
3	-	*No*
4	*Ascaris lumbricoides* *Entamoeba histolytica*	*Yes**
5	*Enterobius vermicularis*	*Yes**
6	*Entamoeba histolytica*	*Yes**

***It was not possible to perform morphological differentiation of the other parasite species detected**

larvae, eggs, cysts and similar structures to calcium phosphate crystals. Table 1 summarizes the results of the presence of various species of human parasites in water reservoirs 1-6.

Different types of parasites were visualized, among which were identified: *Ascaris lumbricoides*, *Entamoeba histolytica*, *Enterobius vermicularis*. Particularly, these three species are noteworthy because they were present in at least two different water reservoirs. Moreover, the water reservoir 1 showed the highest contamination by parasites and none parasite was identified in the reservoir 3.

In this study, the parasites identified are known to cause some serious diseases (Neves et al., 2012). In addition, these parasites are commonly found in parasitological test routine that shows the potential contamination of water by sewage, and the local people seem to be already infected by parasites.

Several residents in Vale Verde district still use septic tanks for disposal of faeces droppings. This custom can be a potential source of groundwater contamination, tanks and streams due to proximity between human waste and water tanks. Using contaminated water for irrigation of food is dangerous and highly detrimental to the health of the farmers and consumers (ERDOGRUL and SENER, 2005). In this studied region, the raw vegetables may contain high load of parasites and other pathogens, resulting in morbidity for local population.

An important sanitary requirement to determine the quality of drinking water includes the absence of unhealthy organisms such as bacteria, protozoa, helminths and virus. Furthermore, drinking water can be defined as "water for human consumption, with microbiological, physical, radioactive and chemical parameters, and meet the potability standards and that does not offer health risks" (MINISTÉRIO DA SAÚDE, 2011). From these definitions, five of the six water reservoirs analyzed (83%) may be considered as unfit for human consumption.

Parasites present in water can contaminate the local population, by direct ingestion of contaminated water, skin contact or consumption of irrigated food, representing a serious public health problem. However, other forms of infection are known, such as walking barefoot, animal faeces, dirty fingernails, and not handwashing (MORELI et al., 2006; FERNANDES et al., 2015). Thus, the information access on the subject and acquire personal hygiene habits continuous being an excellent means to preserve human health.

The majority of the analyzed water reservoirs presented different parasite species and these water samples have no quality compatible for use in irrigation of food, presenting contamination by *Ascaris lumbricoides*, *Entamoeba histolytica* and/or *Enterobius vermicularis*. Other types of parasites have been found and, in later works, they will be identified. In this way, the local authorities should educate the public

on the health hazards to use water reservoirs contaminated. Furthermore, the basic sanitation from the Vale Verde district needs to be totally implemented and the water reservoirs used for irrigation of food intended for human consumption must be submitted to previous treatment before use or other water sources to irrigation could be found.

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