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Investigation about contaminated parasites for Al-Muthana province waters

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Abstract

The aim of this study is to know the existence of cysts, oocysts and eggs of the parasites in rivers, waste and tap waters in Al-Muthanna province by examining 52 water samples of three regions in this province which were Al-Samawah, Al-Rumaytha and Al-Khider cities. We showed the following parasites *Cryptosporidium* oocysts, *Fasciolopsis buski* eggs, and *Ascaris lumbricoides* eggs, with rates 25%, 3.8 and 9.6% respectively. Waters of Al-Khider city were more containing on parasites that was included all types of watched parasites in this study.

Keywords: Cryptosporidium oocysts, Fasciolopsis buski eggs, Ascaris lumbricoides eggs, tap water, rivers, waste water.

Introduction

Water born contamination is considered as a main source of human infectious diseases which could relate to fecal pathogens. In many situations, transmission of these pathogens is often associated with exposure to contaminated waters that used for drinking or agricultural irrigation. Inadequate sanitation facilities or bad wastewater management practices of disposing wastewater can be important causes of water contamination with fecal pathogens (Cairncross and Feachem, 1993).

Transmission of protozoan and metazoan parasites through the environmental routes especial contamination water supply can be particularly significant. Two factors can pose a major threat to human and animal health, producing infective stages in large numbers and an ideal suitable environment for these stages.

The wet environment could increase the parasitic ability to survive for prolonged periods of time. The increased chance of environment contamination with protozoa or helminths may relate to the huge use of natural resources as a part of increased people demands (Smith, 1999). Development of diagnostic methods of parasites relates mainly to the waterborne outbreaks that happened in the last 40 years which helped in reappraisal the isolation and detection techniques. Although the developed diagnostic methods have explained the main transmission methods of metazoan, the detection of protozoa still needs more specific and universal techniques (Barnard and Jackson, 1984). The awareness of the parasitic contamination is due to their impacts on the public health (Smith, 1999). The epidemiological studies are required to assess the risk of water contamination and to evaluate the robust and efficient diagnostic methods. The aim of this study is to detect the parasitic contamination in three water sources; tap water, river and waste.

Materials and Methods

352 samples of water were collected, and they were; 1 liter of 127 samples of waste water,110 samples of river waters and 115 samples of tap waters from different places and homes waters of Al-Muthanna province (Al-Samawah (the province center), Al-Rumaytha (the second biggest district) and Al-Khider (the third biggest district)). The samples could sediment for 1-2 hours, depending on the size of the container. The container used for sedimentation should be an open-topped, straight-sided as removing of the supernatant can be easier (Ayres *et al*.,1996). 90% of the supernatant was removed by using a suction pump or siphon.

The sediment was carefully transferred to centrifuge tubes and spin down at 2500 rpm for 15 minutes. The supernatant was removed. Then the sediment was rewashed thrice as above. After that, the pellets contents were resuspended in two volumes of acetoacetic buffer, pH 4.5 and the mixture was mixed with vortex or by hand. Finally, the tubes were centrifuged at 3500 rpm for 15 minutes. The samples have been separated into three distinct layers. Helminth eggs, larvae and protozoa, were precipitated in the bottom layer. The clear layer above is the buffer.

The fatty and other debris accumulate at the top and form a thick dark plug. The volume of the pellet containing the eggs was recorded and then poured off the rest of supernatant. This plug can be loosened by moving a fine needle around the side of the centrifuge tube then it could be sucked by pasture tubes. The sediment was resuspended in five volumes of zinc sulfate solution. The mixture was mixed thoroughly, preferably by using a vortex. Quickly an aliquot was removed by using Pasteur pipette and transferred to a glass slide for microscopic examination. At the end, the glass slides were examined under 10× or 40× magnification of the microscope. All the results were analyzed as mean ± S.E.M using GraphPad Prism version 7.

Results

A comparable range of parasites were found in raw and influent wastewaters, rivers and tap water in Al-Muthanna province including three regions Al-Samawah, Al-Rumaytha and AlKhider towns. Microscopic examination of analyzed water samples has allowed to identify different parasites of protozoa, Nematodes and Trematodes. One types of protozoa (*Cryptosporidium*), the Nematodes *Ascaris lumbricoides* eggs and the Trematode *Fasciolopsis buski* eggs were isolated from the analyzed samples.

From this study we found coexisting in waste waters protozoan parasites (*Cryptosporidium* oocyst with rates 29.6% of positive samples) and eggs of Nematodes (*Ascaris lumbricoides* with rates 18.5%). Examined of river's waters showed presence of *Cryptosporidium* oocyst and *Fasciolopsis buski* eggs with proportion of 20%. While tap water contained only *Cryptosporidium* oocyst with ratio of 20%. The total rates of these parasites in all examined types of water were: *Cryptosporidium* oocyst 13%, *Fasciolopsis buski* eggs 3.8% and *Ascaris lumbricoides* eggs 9.6% (Figure 1).

In Al-Samawah water samples, *Cryptosporidium* oocysts were found in both waste water and tap water while *Ascaris lumbricoides* eggs in waste water. In Al-Rumaytha city, *Cryptosporidium* oocysts were found in tap water only. The water samples collected from Al-Khider were more contaminated with the parasites as

Cryptosporidium oocysts, *Ascaris lumbricoides* eggs were found in waste water, *Fasciolopsis buski* eggs, *Cryptosporidium* oocysts in river water and *Cryptosporidium* oocysts in tap water (table 2 and figure 2).

Discussion

The results of our study showed that there is a wide range of parasites found in examined water supplies which grouped under three common categories: protozoa, trematodes and nematodes. *Cryptosporidium* oocysts were more abundance than other parasites in the watery samples of Al-Muthanna province with rate of 13% of the total collected samples and this agrees with Smith (1999) who mentioned that this parasite is widely distributed. *Cryptosporidium* was found in tap water samples of the three regions included in the examination which could relate to the resistance of the protozoan oocysts to the standard concentrations of chlorine or ozone in drinking water, (Kayser *et al*., 2005).

Trematode (*Fasciolopsis buski*) presents with percentage 3.8% of positive samples in river samples only which may relate to its way of transmission by feces of their hosts that can reach to the river (Muller and Wakelen, 2002).

Ascaris lumbricoides with ratio of 9.6%, its eggs have a lipid layer and it makes them resistant to different unusual conditions such as desiccation and low temperatures (Roberts and Larry, 2009). Hosts can get infection by swallowing contaminated waters with these eggs or unhatched Juveniles will (Read, 1995). Waters of AlKhider city was more contaminated than other cities which included in this research and this could be due to unproperly treated drinking water. With exception Al-Rumaytha, both Al-Samawa and AlKhider lack to station of filtration and sterilization of water, their tap water come from Al-Rumaytha station through water's pipes for long distances. Because of solar radiation (UV), activated carbon filtration and aeration at various temperatures, the residual Chlorine concentrations can decrease or even entirely from the tap water (Lim *et al*., 2008)

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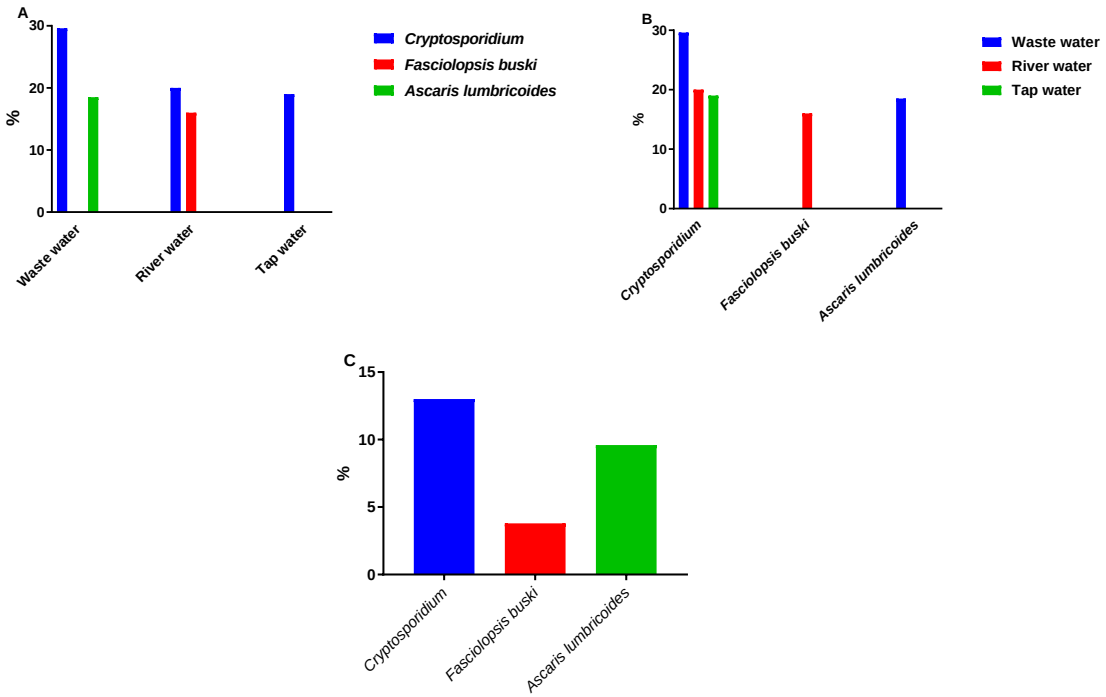

Figure 1: Proportions of the positive samples of parasites coexisting in waters of Al-Muthanna province. A- Different samples of waters were examined for parasitic existence. Waste water was more containing to parasites than other. The parasites were scheduled depending on their existence. Cryptosporidium was the most dominant parasite among other parasites in all three kinds of water (B) or even the percentage was calculated depending on the total samples (C).

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Table 2: distribution the parasites according to regions of

Al-Muthanna province

the city / water types	Al-Samawah	Al-Rumaytha	Al-Khider
Wast water	*Cryptosporidium* oocysts + *Ascaris lumbricoides* eggs	-	*Cryptosporidium* oocysts + *Ascaris lumbricoides* eggs
River water	-	-	*Cryptosporidium* Oocysts + *Fasciolopsis buski* eggs
Tap water	*Cryptosporidium* oocysts	*Cryptosporidium* oocysts	*Cryptosporidium* Oocysts

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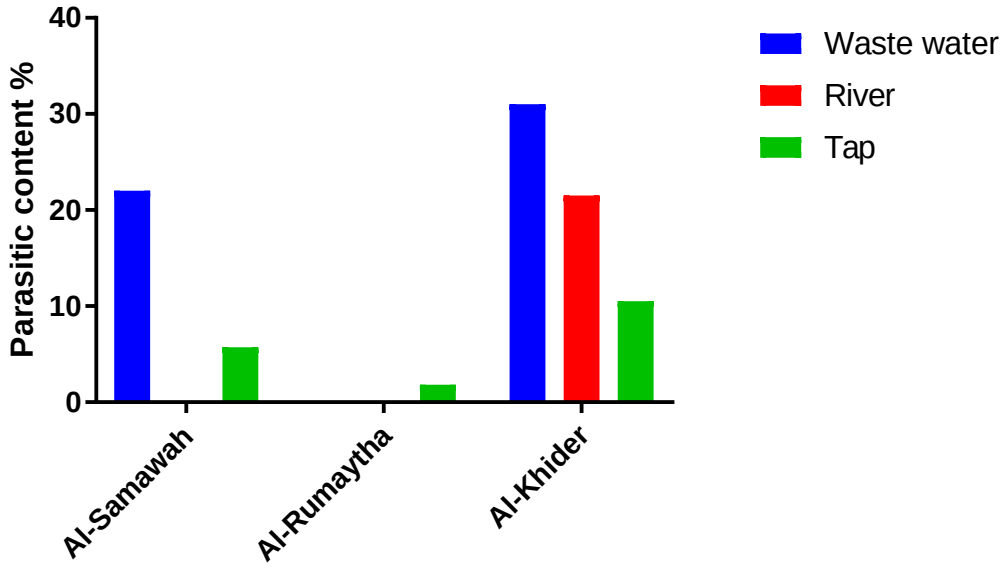

Figure 2: the parasitic contents of different water sources in different places of Almuthanna province. Al-khider samples showed more parasitic contaminations in all water sources.

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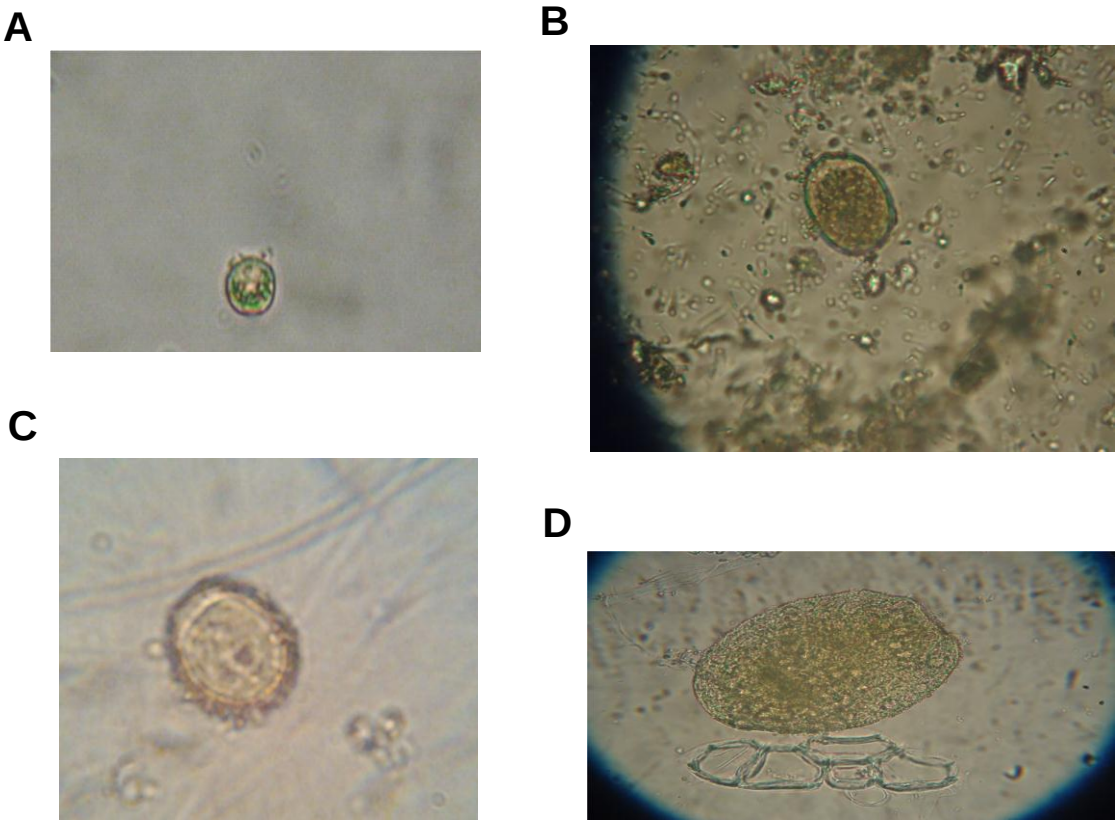

Figure 3: Microscopic photos of different kinds of the parasites found in the examined samples. These are *Cryptosporidium* oocyst (A), *Ascaris lumbricoides* eggs (B and C) and egg of *Fasciolopsis buski* (D).