

TRACKING DOWN INTERNAL PARASITES EXTERNALLY: WATER TESTING IN BELIZE

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The purpose of my project was to test water sources in villages and at schools on the periphery of the Rio Bravo Conservation Management Area (RBCMA) for intestinal parasites, specifically *Giardia lamblia*, *Hookworm*, and *Balantidium coli*.

LITERATURE REVIEW

Intestinal parasites and the illnesses they cause are a significant problem for people all over the world, creating health problems that may lead to death (Goldberg, 2007). In particular, parasitic infections of the colon are a large problem for developing countries because many of the individuals stricken are children (Goldberg, 2007).

Two studies highlight the prevalence of intestinal parasites and diarrheal diseases in children. The results of a study of Central American immigrant children living in the United States showed that of the 96 children tested, 62 (65%) tested positive for an intestinal parasite (Sarfaty, Rosenberg, Siegel, & Levin, 1983). Of the 62 that tested positive, 33 had more than one intestinal parasite and 14 had more than three; of the 96 that were tested, 44 had a pathogenic parasite that included *Giardia lamblia* (Sarfaty, et al, 1983). This study was significant in showing that Central American immigrant children have a high probability of carrying intestinal parasites, including *Giardia lamblia*. A second study (Gross, Schell, Molina, Leão & Strack, 1989) looked at the rate of diarrheal diseases in Brazil and showed that of the children tested, 70.4% were infected by at least one pathogenic intestinal parasite. Because acute diarrheal illnesses are a major worldwide problem, knowing whether a water source contains intestinal parasites is the crucial first step to eliminating the debilitating problem.

Former McMaster Scholar Eric Dix conducted a survey on intestinal parasites in the various RBCMA water sources (Dix, 2005). Seven sites were sampled in Belize: a bridge over the creek in the RBCMA, Irish Creek, New River Lagoon, Harry Jones Creek, Ramgoat Creek, New Hope Village, and two wells at San Carlos Village (Dix, 2005). Dix's analysis found no parasites at the Irish Creek, Harry Jones Creek, Ramgoat Creek, or the deep well in the San Carlos Village. Dix did determine that *Necator americanus* and *Balantidium coli* were present in the open well in the San Carlos Village, as well as the New Hope Village (Dix, 2005).

These results were significant because the samples that showed positive results for the intestinal parasites had been sampled purely by chance: testing was supposed to be limited to inside the RBCMA perimeter. It is also important to note that the locations that tested positive were closest to the school. Dix's study suggests that children are being affected by the intestinal parasites here, as well. By finding *Necator americanus* and *Balantidium coli* in wells in two villages, it became more important to re-examine the periphery sites for the presence of intestinal parasites.

One of the most significant reasons for re-examining and continuing Dix's project is that the areas inside the Rio Bravo did not show the presence of intestinal parasites, but areas on the periphery in close proximity to adults and especially to children did. Children in these areas are likely to be most affected by intestinal parasites and have the most at stake if intestinal parasites are present in the water source. Remediation of the water sources would be possible, which would help alleviate illness in both adults and children.



PROJECT DESIGN

The methodology used for this project was similar to the methodology that Dix used. A Nalgene reusable filter holder was used to filter the water through Millipore MF-Millipore Mixed Cellulose Ester Membranes: 0.45um pore size. A volume size of 5 liters was used for each site. The membrane was collected upon filtration and placed in a 50 ml conical centrifuge tube that contained 10% formalin. Upon returning to the United States, the membrane was removed from the formalin and an elution buffer was used to remove any possible intestinal parasites. The

vials were centrifuged to create a pellet and microscope slides were created for each of the membranes collected.

RESULTS

Various drinking water cisterns and wells in schools and villages on the periphery of the RBCMA were tested, including Irish Creek, New Hope Village, Saint Paul's Bank, Isabella Bank, and San Carlos. Of all the sites tested, none showed the presence of intestinal parasites, including *Giardia lamblia*, *Balantidium coli*, or *Necator americanus*, although the slides did show the presence of plant matter.

CONCLUSION

The microscope slides did not show *Giardia lamblia*, *Balantidium coli*, or *Necator americanus* at any of the sites, which is to say that no intestinal parasites were seen in any of the tests performed in the RBCMA in Belize during 2007 to 2008. These results do not definitively mean that there are no intestinal parasites present in the water sources, only that during this study none were found. One cause for this is that the sampling was performed from an environmental source, meaning that the water had to be filtered and essentially concentrated on the membranes. This environmental sampling may not catch all of the parasites present due to the size of the sample taken compared to the size of water source. Additional studies on fecal samples taken from individuals in the villages would yield more conclusive findings.

REFLECTION

Before going into Belize, I did not really know what kind of impact I would be able to have on a community. I knew even less about what kind of impact Belize would have on me. Working with the people in the villages taught me that I can be a global citizen. I was able to see myself not as an American working with citizens in Belize but as one person working with others toward a common goal.

This experience has also affected my school work and career goals. Now that I have seen how everything is connected, I am hungry for information and more focused on my research, knowing that it all has a purpose in the end.

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