Coliform Bacteria in the Drinking Water of Highland Communities in Rural Guatemala

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Factors of unsafe water, sanitation and hygiene are responsible for an enormous burden of disease due to infectious diarrhea. The majority of this burden is taken up by developing countries and most often in children under five years old. The San Lorenzo area is a rural collection of communities in the highlands of Guatemala that has a number of environmental health problems including diarrhea disease.

To investigate the possible link to drinking water source contamination as a cause for diarrhea transmission in the area we analyzed water samples for the fecal coliform bacteria E. Coli. We collected and analyzed samples from 30 households in two of the communities that use the three major sources of drinking water. We combined the water analysis with a brief questionnaire asking residents standard sanitation and hygiene questions.

The results of the analysis show that piped water samples do not have evidence of fecal contamination with 100% of the samples we collected having fewer than 10 colony forming units (CFU) of E. Coli per 100mL of water. Natural spring and well samples on the other hand did have evidence of fecal contamination. 43% of spring samples analyzed had between 10-100 CFU per 100mL, 28% were high in contamination (greater that 100 CFU per 100mL) while 71% of well water samples analyzed had greater than 100 CFU per 100mL. There was a significant difference between piped and non-piped water source quality (Fisher's Exact P-value of <0.005). Almost all stored water samples (95%) we analyzed had greater than 10 CFU per 100mL and 50% of the samples had greater than 100 CFU per 100mL. It did not matter how clean the source water was once it was stored it became equally contaminated (Fisher's Exact P-value of 1.0). 65% of the previously boiled water samples that were
collected were found to have low- contamination levels (less than 10 CFU per 100mL) with 17% of samples having greater than 100 CFU per 100mL water analyzed.

Piped water is the cleanest water source but if it is not available constantly then residents are forced into storage practices that ultimately contaminate the water with fecal coliform. All of the participants answered that they do boil water before consuming. This is a proven effective water sterilization practice and although not the most efficient should continue to be encouraged to prevent diarrhea disease transmission via contaminated water in storage.