

20 CEE 705  
November 18, 2005

### Microbial Source Tracking of Freshwater Samples from Tanzania / DNA Identification from Cellulose Filters

In October of 2005, I traveled to Tanzania to identify the problems in the drinking water of a village called Roche. While there, I took samples in the field that did not pass through the 0.2 micron pore size cellulose filter, and transported the intact filters back to the USA and stored them in a -20°C freezer. Presumably, the DNA from any bacteria and viruses present within the original water samples will have remained intact and within the housing of the individual filter from which they are to be evaluated. The keywords used to identify related subject matter include all words in the title of this paper, as well as: Lake Victoria, Eastern Africa, viruses, pathogens, bacteria, water born disease, and surface water.

I need a method for determining what specific bacteria and viruses are present in the water, and so I found a DNA extraction method, described in the article "Simple, rapid method for direct isolation of nucleic acids from aquatic environments," that can be done on the type of filters I used [4]. This article was originally published in 1988, so I thought I could benefit from reading some more recent publications along the same lines of information. I used a link to find other publications that cited the "Simple, rapid..." article, and searched for articles appropriate to surface water sampling that had to do with identifying species present within a field sample. That is how I can across the article, "Improved method for recovery of mRNA from aquatic samples and its application to detection of mer expression" [5]. I was finding several articles all in the *Applied and Environmental Microbiology* journal, so I looked it up on *Compendex* and found an article entitled, "Evaluation of use of PCR and reverse transcriptase PCR for detection of pathogenic bacteria in biosolids from anaerobic digestors and aerobic composters," which goes into more detail about specific polymerase chains and source identification [3].

I did a web search to get some more area-specific details – because I would like to know what elements to expect from Eastern Africa, specifically the area near Lake Victoria in the Tarmine District of Tanzania. I found an article from Thogersen entitled, "Bio-stabilization of drinking water in supply systems as observed in the tropics," which delineates a water study done in Tanzania in similar conditions to those found in Roche [6].

I found a book that described some more methods used in DNA identification / source tracking [1]. Not every section of the book was relevant to my subject, but there were a few segments with some very useful information. Finally, to complete this assignment, I found a reference book entitled, *Water Quality and Treatment – A Handbook of Community Water Supplies*, which is an excellent resource for looking up what specific kinds of bacterial communities can be present and what to look for in the individual cases [2].

## Bibliography

- [1] Grody, W. W. (1994). "Screening for pathogenic DNA sequences in clinically collected human tissues." *Ancient DNA: Recovery and Analysis of Genetic Material from Paleontological, Archaeological, Museum, Medical and Forensic Specimens*, edited by Herrmann, B., Hummel, S. Springer-Verlag, NY, 69-92. [geo QP620 .A53 1994, Molecular Methods, DNA Extraction, Polymerase Chain Reaction]
- [2] Geldreich, E. E., LeChevallier, M. (1999). "Microbial Quality Control in Distribution Systems." *Water Quality and Treatment – A Handbook of Community Water Supplies*, 5<sup>th</sup> ed., edited by Letterman, R. D. McGraw-Hill, 1-32. [reference book]. *New York*
- [3] Burtscher, C., Wuertz, S. (2003). "Evaluation of use of PCR and reverse transcriptase PCR for detection of pathogenic bacteria in biosolids from anaerobic digestors and aerobic composters." *Applied and Environmental Microbiology*, 69(8), 4618-4627. [found on *Compendex*].
- [4] Somerville, C. C., Knight, I. T., Straube, W. L., Colwell, R. R. (1988). "Simple, rapid method for direct isolation of nucleic acids from aquatic environments." *Applied and Environmental Microbiology*, 55(3), 548-554. [found using the *Applied Science and Technology* database].
- [5] Jeffrey, W. H., Nazaret, S., Von Haven, R. (1994). "Improved method for recovery of mRNA from aquatic samples and its application to detection of mer expression." *Applied and Environmental Microbiology*, 60(6), 1814-1821. [found from Somerville article Science Citation Index and linked to PMC – PubMed Central <http://www.pubmedcentral.gov>].
- [6] Dahi, E., Thogersen, J. (1996). "Bio-stabilization of drinking water in supply systems as observed in the tropics." *World Journal of Microbiology and Biotechnology*, 12(5) pp. 543-547, [http://www.diva-portal.org/diva/getDocument?urn\\_nbn\\_se\\_liu\\_diva-2518-1\\_\\_fulltext.pdf](http://www.diva-portal.org/diva/getDocument?urn_nbn_se_liu_diva-2518-1__fulltext.pdf) [accessed 11/14/05].