

Heavy metal tolerance and antibiotic resistance profiles of gram negative bacteria isolated from Lake Victoria, Kenya

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Abstract

Pollution and increased levels of heavy metals in the Lake Victoria Wetlands are suspected to be negatively influencing the biota in one of the world most important freshwater resources. In this study, fecal contamination of water in the Lake Victoria wetlands was investigated using the standard coliform test. Gram-negative bacteria were isolated by plating on Mackonkey's and EMB media. Isolates were characterized, and their ability to grow in the presence of heavy metals tested. Isolates were also tested for resistance to commonly used antibiotics. The study was conducted both in the dry and wet seasons. Fecal contamination was detected in all tested water samples, as evidenced by the isolation of *Escherichia coli* both in the wet and dry seasons. Coliform counts of above 1100 MPN/100 ml were detected. Ninety-five and forty-five gram-negative bacterial isolates were obtained in the dry season and wet seasons, respectively. Isolates from the dry season were resistant to nalidixic acid (66%), ampicillin (54%), and tetracycline (28%). They were however largely sensitive to gentamycin (95%) and streptomycin (98%); 41.1% percent of the isolates showed multi-drug resistance. A similar antibiotic resistance pattern was detected in the wet season, and 31.1% of the isolates were multi-drug resistant. Many of the isolates were resistant to Zinc and Copper (final conc. 1.6 g/l each), but largely sensitive to mercury (0.05 g/l; 52%) and lead (2 g/l; 89%). Although, tolerance to heavy metals is usually associated with plasmids, which also encode resistance to antibiotics, a direct correlation between antibiotic resistance and heavy metal tolerance by the isolates obtained in this study cannot be established. Further work needs to be conducted to establish the molecular basis of resistance. Constant monitoring of antibiotic resistance levels in bacteria from Lake Victoria wetlands is essential, considering the prevalence of water borne diseases in the area.

Keywords: Lake Victoria, fecal pollution, Gram Negative bacteria, Heavy metal tolerance