**ABSTRACT**

The prevalence of waterborne viral diseases is still a major problem in developing countries like Uganda. This research was conducted to study the abundance of selected waterborne viruses (Adenoviruses, Rotaviruses, Enteroviruses and Hepatitis viruses) in the southwest region of Kampala, Uganda (Figure 1). In the summer of 2016 a total of 15 water samples were collected from 5 sampling locations (Figure 2). The samples were recovered using electropositive cartridge filters and quantified by the real-time Polymerase Chain Reaction (qPCR). The concentrations of viruses varied between $5.79 \times 10^4$ to $8.13 \times 10^7$ genomic copies/L.

**BACKGROUND**

Adenovirus, rotavirus, and hepatitis virus have been discovered to be prevalent both in drinking water and raw sewage in impoverished areas of Kampala (1,2). The presence of such waterborne viruses has lead to multiple outbreaks of illnesses such as diarrhea, gastroenteritis and hepatitis with the most vulnerable groups being the elderly and children under the age of five. For example, an average of 32% of children under the age of five admitted to Mulago Referral Hospital in Kampala, from July 2006 to December 2012 suffered from diarrhea and vomiting (3). Also, 37% of children under the age of five at four hospitals in central Uganda had severe diarrhea (4). Both studies attributed the diarrhea outbreaks to the presence of rotavirus in stool specimens.

**METHODS**

- A total of 15 environmental samples were collected with electropositive cartridge filters. Sampling was carried out in accordance to the US EPA Methods for Virology. The sampling apparatus was sterilized with a 0.52% chlorine solution and dechlorinated with a 2% sodium thiosulphate ($Na_2S_2O_3$) in between sampling events so as to avoid cross contamination (Figure 3).
- The sequence of analytical methods include: collection and concentration of viruses using electropositive cartridge filters, elution of viruses with buffered beef extract, RNA and DNA extraction, reverse transcription, quantification of prevalent viruses using qPCR.

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**REFERENCES**


**RESULTS**

![Graphs showing concentrations of adenovirus, enterovirus, hepatitis A virus, and rotavirus in samples from Nakivubo Channel and Apparatus Sterilization](image)

**DISCUSSION**

The concentrations of viruses of interest at all locations varied between $5.79 \times 10^4$ to $8.13 \times 10^7$ genomic copies/L. Adenovirus and enterovirus concentrations were the highest, $1.53 \times 10^5$ to $1.98 \times 10^7$ genomic copies/L and $3.17 \times 10^5$ to $8.13 \times 10^7$ genomic copies/L respectively while the rotavirus and hepatitis A virus concentrations were the lowest ranging from $5.79 \times 10^4$ to $5.79 \times 10^5$ genomic copies/L and $1.41 \times 10^3$ to $1.11 \times 10^4$ genomic copies/L respectively. Adenoviruses tend to be stable in the environment due to their double stranded DNA hence the high genomic copy concentrations in contrast to the low stability of RNA viruses like rotavirus and hepatitis virus. The observed concentrations of rotaviruses were higher than those reported in other polluted environments in Kampala (1). The low reduction of virus concentrations (log 1-2) in effluent samples from the wastewater treatment plant suggest that the conventional activated sludge method used was ineffective in removing viral particles. Samples from the swamp showed relatively lower concentrations of the viruses since swamps act as natural strainers. The presence of viruses in these water sources poses a health challenge to the public that needs to be addressed to prevent future waterborne disease outbreaks.