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The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

TECHNICAL BRIEF

Water and health

Investigating the occurrence of Vibrio cholerae in KZN surface waters

A completed Water Research Commission (WRC) study determined the presence of *Vibrio cholerae* from selected rivers in KwaZulu-Natal.

Background

Vibrio cholerae is an autochthonous member of the aquatic environment and the causative agent of cholera. Although the majority of environmental isolates of ***V. cholerae*** are considered to be non-pathogenic, studies have confirmed that natural populations of the bacteria can serve as a precursor for new pathogenic or epidemic strains.

Because of this inherent risk, it is important to understand the mechanisms that affect the natural population of ***V. cholerae*** in the environment. An understanding of the occurrence and survival of ***V. cholerae*** in the environment would contribute towards effectively monitoring water bodies for the presence of ***V. cholerae***.

This could assist in the early detection of cholera outbreaks giving local municipalities and water boards the opportunity to put measures in place to prepare and even prevent possible outbreaks.

Aims of the WRC study

The driving force influencing ***V. cholerae's*** survival in the environment is likely an integrated outcome of changes in physico-chemical factors, availability of suspended substrates and abundance of biological hosts or reservoirs. This study was undertaken to determine the presence of the bacteria in three rivers in KwaZulu-Natal.

The study assessed whether ***V. cholerae*** was present in the environment and also to better understand where and how the bacteria live in this aquatic environment.

Methodology

Different niches that may facilitate survival of *V. cholerae* in rivers were identified and sampled. These included zooplankton, phytoplankton, amoeba, invertebrates, animal stools, sediments and the river water itself. Samples were collected in and around the Msunduzi, Umlazi and Isipingo rivers once monthly for a period of 14 months.

The samples were also analysed for total coliform and ***E.coli*** counts. Temperature, pH and conductivity of the samples were measured at the sample sites and turbidity and salinity were measured at the laboratory.

Culture dependent and culture independent real-time PCR methods were used for the detection of V. cholerae from the selected samples. A culture dependent high resolution melt (HRM) real-time PCR method was performed at ERWAT laboratory in parallel to the real-time PCR methods conducted at the Water and Health Research Centre to compare and validate PCR results.

Results

A total of 124 water samples were analysed. The results indicated that 67% (83 of the samples) tested positive for the presence of non-toxigenic ***V. cholerae*** with the culture dependent real-time PCR method. In contrast, only 37% or 46 samples tested positive for the presence of non-toxigenic ***V. cholerae*** with the culture independent real-time PCR method.

The non-toxigenic strains were isolated from 71% of 676 river water samples collected at all sites sampled for the three

rivers studied. Non-toxigenic ***V. cholerae*** was detected from all sample types except for amoeba and cow stool samples.

Conclusion

The results from the study indicated that the Msunduzi, Umlazi and Isipingo rivers are frequently isolated with autochthonous non-toxigenic ***V. cholerae*** and may cause infections in sensitive population groups, such as immune-compromised individuals. The non-toxigenic bacteria in the rivers were found in a free-living form or in association with planktons, invertebrates and the sediment compartment of the rivers.

The results of the study as well as from previous studies indicate that environmental ***V. cholerae*** strains are represented by the non-toxigenic strains.

The study concluded that the environmental ***V. cholerae*** strains are well adapted to survive in the environment and one such adaptation is the ability to grow as a biofilm on a range of abiotic and biotic surfaces.

Further reading:
To order the reports, ***Investigating the occurrence and survival of Vibrio Cholerae in selected surface water sources in the KwaZulu-Natal province of South Africva*** (**Report No. 2168/1/14**) contact Publications at Tel: (012) 330-0340, Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.