Prevalence of enteropathogenic bacteria in treated effluents and receiving water bodies and their potential health risks

Giorgis Z. Teklehaimanot a, B. Genthe b, I. Kamika a, M.N.B.Momba a,

a Department of Environmental, Water and Earth Sciences, Water Care Unit, TUT, Private Bag X680, 175 Nelson Mandela Drive, Arcadia Campus, Pretoria 0001, South Africa
b Natural Resources and the Environment, CSIR, Stellenbosch, South Africa

Abstract

The failure of wastewater treatment plants to produce effluents of a high microbiological quality is a matter of great concern in terms of water resource pollution. A more serious concern is that this water source is used by communities in developing countries for multiple purposes, which include drinking, recreation and agriculture. The current study investigated the prevalence and potential health risks of enteropathogenic bacteria (Salmonella typhimurium, Shigella dysenteriae and Vibrio cholerae) in the treated effluents of three selected South African Wastewater Treatment Works as well as their receiving water bodies. Culture-based and polymerase chain reaction techniques were used to detect and identify the pathogenic bacteria. The conventional methods revealed that of the 272 water samples collected, 236 samples (86.8%) tested presumptively positive for Salmonella spp., 220 samples (80.9%) for Shigella spp. and 253 samples (93.0%) for V. cholerae. Molecular test results indicated that out of the randomly selected presumptive positive samples (145), zero to 60% of samples were positive for S. typhimurium and S. dysenteriae and 20% to 60% for V. cholerae. For the health risk assessment, the daily combined risk of S. typhimurium, S. dysenteriae and V. cholerae infection was above the lowest acceptable risk limit of 10−4 as estimated by the World Health Organization for drinking water. This study showed that the target treated wastewater effluents and their receiving water bodies could pose a potential health risk to the surrounding communities.