Incidence of Salmonella spp. in sewage and semi-urban waste water treated by pond oxidation method at the University of the North

JM Gopo*, MP Setoaba, WM Lesufi and MM Sibara

University of the North, Department of Microbiology, POBox 1106, Sovenga, South Africa



Introduction

The study was carried out to determine the incidence of Salmonella spp. in sewage and semi-urban waste water treated by the pond-oxidation methods at the University of the North, South Africa. The four oxidation ponds receive sewage and waste water from the University of the North which has a total population of 20 000 people and from the Mankaweng residential township, with a population of about 15 000. The overflow waters from these ponds, flow over a surrounding grazing area before being collected into the Matangwaneng Stream which flows through Mamotintane Village. The villagers use the stream water for washing their clothes and for watering their livestock. Potable drinking water and water for other domestic uses for the Mamotintane Villagers comes from a borehole situated near the Mantangwaneng Stream. Most of the sewage and semi-urban waste water from the ponds' oxidation treatment system is recycled and used for irrigating the main sports fields at the University of the North, thus increasing the probability that the grass lawn on the main sports fields was contaminated with pathogens such as Salmonella. Salmonella spp. were targeted in this study because they are causative agents of human salmonellosis which results in enterocolitis, typhoid fever, paratyphoid fever and septicemia (Al-Qarawi et al., 1995; Petit and Wamola, 1994).

The diseases can either be symptomatic or asymptomatic (Raphael et al., 1983). *Salmonella* spp. are harboured in and are transmitted by sewage and other polluted waters (Shuval, 1991). *Salmonella* spp. are also water-and food-borne pathogens that cause food-borne human salmonellosis (Cano et al.; Cheng, 1992; Falcao et al., 1993; and Ryan, 1990).

Methods which have been employed in the detection of Salmonella spp. in polluted and recycled water are: coliphage test (Maniwego et al., 1993), monoclonal antibody-based ELISA (Brigmon et al., 1992), and nucleic acid-based tests (Fitts et al., 1983; Gopo etal., 1988; Cheng etal., 1992; and Way et al, 1993). The nucleic acid probe assays are based on the principle of DNA-DNA hybridisation methods using either radioisotopes or nonisotopic materials for the labelling system (Olsen et al., 1995). In developing countries, the use of radioactively labelled DNA probes is not safe and also such labelled DNA probes have a short shelf-life when compared to non-isotopically labelled probes (Rubin, 1990). Short non-isotopically labelled oligonucleotides may be associated with false positive and false negative results (Olsen et al., 1995; and Tsen et al., 1991). In this study, a Salmonella genomic DNA probe (1.8 Kb) was used (Gopo and Chingobe, 1995).

Study area

The study area for this research project was made up of two primary and two secondary oxidation ponds of the University of the North, the irrigation water for the main campus sport-field, the area surrounding the four oxidation ponds, Matangwaneng

^{*} To whom all correspondence should be addressed. (09263) 4-860320-9; fax (09263) 4-860330-3

Received 29 July 1996; accepted in revisedform 23 July 1997.