

# Bacterial and chemical quality of water supply in the Dertig village settlement

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## Abstract

Water contaminated with microbiological and chemical constituents can cause a variety of diseases. Water intended for human consumption should be safe, palatable and aesthetically pleasing. Water sources have different qualities influenced by natural or anthropological pollution. In South Africa, the availability of safe and clean water is a serious problem, especially in rural areas. Most people in such areas use water directly from available sources without any treatment and therefore are exposed to a variety of water-related diseases. The objective of this study was to determine the chemical and microbiological quality of drinking water supply to a rural community in order to estimate the health implications thereof. Water samples were collected weekly from five water sources, that is, Lefatheng Well, Tlhaloganyo groundwater, Tlhaloganyo rain water, Matlaisane groundwater and Tshwane River in the Dertig/Lefatheng village settlement which is in Hammanskraal, about 55 km north of Pretoria. To provide an indication of the microbiological quality of the water resources, indicator organisms including heterotrophic bacteria, faecal coliform, total coliform, *Salmonella* and coliphages were used. In order to support the results, bacterial isolates were identified using both the 20E and 20NE API systems to confirm their isolation. For the chemical quality analyses, different chemical quality variables including temperature, pH, dissolved oxygen (DO), aluminium (Al), iron (Fe), manganese (Mn), fluoride (F), nitrate (NO<sub>3</sub>), nitrite (NO<sub>2</sub>) and colour were determined. The chemical quality of all the water sources analysed was acceptable. In contrast, however, the microbiological quality of all the water sources exceeded the standard for potable water and the sources pose a serious health risk to consumers.

## Introduction

No source of water that is intended for human consumption can be assumed to be free from pollution (*The Microbiology of Water*, 1994). Water sources have different qualities influenced by natural or anthropological pollution. Polluted water is an important vehicle for the spread of disease. It has been estimated that 50 000 people die daily world-wide as a result of water-related disease (Schalekamp, 1990). A large number of people in developing countries lack access to adequate water supply. In South Africa it has been estimated that more than 12 m. people do not have access to an adequate supply of potable water (DWAF, 1994). The availability of safe and clean water seems not to be a problem in towns and cities, where consumers generally receive a constant supply of water of high quality. In contrast, however, the inaccessibility of water which is fit for use is a serious problem in rural areas. Most people in these areas use water directly from available and often contaminated sources without any treatment and therefore are exposed to many water-related diseases.

The government has launched projects to ensure the provision of improved water supplies to communities in rural areas, but due to financial and human resource constraints, it is unlikely that the high-quality water will be provided to the majority of such people in the immediate future. Another limiting factor is that in other areas where such water supplies have been provided, the supplies are not always reliable or sufficient, and residents may often have to revert to traditional unprotected sources until the supply is

restored (WRC, 1993). These water sources should therefore be examined for indicators of pollution and when the inspection shows that they are subjected to contamination, remedial action should then be taken. This will result in the decline in infectious and other communicable diseases, and ultimately improve the health standards of rural communities.

In South Africa, few data on quality of water sources and associated health problems are available, since limited surveys have been conducted. The risk of population exposure to water-related diseases is often underestimated because most studies normally approach this problem on a macro-scale, which all too often excludes most rural communities.

This study was aimed at examining the quality of drinking water supply to a rural community in order to estimate how the water supply may influence infection and disease (health implications) in the community. This was done by determining the chemical and microbiological quality of the water supply in relation to the South African guidelines for domestic water (DWAF, 1996). The study was planned to provide information that could assist in working out a model for water supply management in rural communities.

## Materials and methods

### Study site

The experimental site was Dertig/Lefatheng Village, which is situated in Hammanskraal, about 55 km north of Pretoria. The following water sources commonly used in this area were identified and included in the survey: Tlhaloganyo groundwater (pumped from a borehole by a diesel motor and a pump and collected in a tank fitted with a tap), Tlhaloganyo rain water (collected from an impervious roof through a gutter to a tank

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