

UNIVERSITI TEKNOLOGI MARA

**MICROBIOLOGICAL ASSESSMENT OF TREATED
WASTEWATER AND DETECTION OF
ANTIBIOTIC AND CHLORINE RESISTANT
Escherichia coli FROM WASTEWATER
TREATMENT PLANTS IN OMAN**

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ABSTRACT

Oman depends on recycling its treated wastewater as a solution to overcome its limited water supplies and public health safety is therefore an important consideration. This study was carried out to assess the microbiological quality of treated wastewater samples from two wastewater treatment plants (WWTPs) in Oman, the Royal Hospital WWTP and Barka WWTP. This analysis was conducted on secondary and tertiary as well as de-chlorinated tertiary treated wastewater which were sampled during the summer and winter months from August 2007 to January 2008. The aims of the study were also to detect antibiotic and chlorine resistance in *Escherichia coli* using disk diffusion method. Sodium hypochlorite was used as a source of chlorine in the latter. Microbiological analysis showed that highest heterotrophic counts obtained from secondary, tertiary and de-chlorinated treated wastewater from both plants were from samples collected in August 2007, and the lowest were from samples collected in January 2008.

This indicated that the heterotrophs were affected by the variation in seasonal temperatures. Analysis on the heterotrophic counts at three different incubation temperatures, 22°C, 37°C and 42°C indicated that the indigenous aquatic heterotrophs were more affected by the seasonal temperature variations compared to those of human and animal origin and thermotolerant heterotrophs. Total and faecal coliform counts in secondary, tertiary and dechlorinated tertiary treated wastewater samples from Barka WWTP were higher in the summer months and lower in the winter months but in the Royal Hospital WWTP this trend was not obvious in the tertiary de-chlorinated samples. The faecal coliform counts in the tertiary treated wastewater samples of both plants however, fell within the acceptable limits of Omani standards for use in watering public parks and landscapes. The enterococci counts in both plants were also higher in the summer months than in the winter months.

Fifty seven confirmed *E. coli* isolates from both plants were tested for susceptibility to sixteen antibiotics namely Amikacin, Ampicillin, Chloramphenicol, Ciproflaxacin, Gentamycin, Cephalexin, Kanamycin, Cephalothin, Minocycline, Neomycin, Nalidixic acid, Sulfamethoxazole, Streptomycin, Tetracycline, Tobramycin and Trimethoprim. All isolates from the Royal Hospital plant were resistant to at least two antibiotics, whereas those from the Barka plant were resistant to at least one. Tetracycline resistance was exhibited in 86.6% and 62.9% of the isolates from the Royal Hospital and Barka plants respectively. Multiple resistances to cephalothin and tetracycline were exhibited by 90% and 37% of the isolates from the Royal hospital and Barka plants respectively. All isolates were resistant to 0.5 mg/l sodium hypochlorite and the minimal inhibition concentration of 2.5 mg/l sodium hypochlorite was only exhibited in 24% of the isolates.

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