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An assessment of the pollution and multi-drug resistant bacterial status of Ikpoba river in Benin city, Nigeria

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River water is a major source of water for household use in most rural communities in Nigeria. River pollution refers to the Contaminations of rivers which occur when waste and different other pollutants are discharged into river without being properly treated. Studies on river water pollution and their implication to public health has been ongoing. An assessment of the pollution and multi-drug resistant bacteria of Ikpoba river in Benin City, Nigeria was carried out between the months of January to March and May to July for the dry and wet seasons. Standard microbiological and physicochemical procedures were used for the study. Results showed that the density of the microbial isolates was highest during the dry season. There is significant difference (P>0.05) in the heterotrophic microbial counts in both seasons. The discharge point, upstream and downstream bacterial counts for dry season ranged from 1.5±0.00 x 10⁴ cfu/ml to 4.0±0.23 x 10⁶ cfu/ml whereas the wet season samples had lower counts ranging from 2.0±0.05 x 10³ cfu/ml to $4.0\pm0.21 \times 10^4$ cfu/ml. Similarly, the fungi count for the dry season ranged from $6.0\pm0.01 \times 102$ cfu/ml to 1.4 ± 0.53 x 10⁶ cfu/ml while for the wet season it ranged from $5.0\pm0.00 \text{ x}$ 102 cfu/ml to $9.0\pm0.32 \text{ x}$ 10⁴ cfu/ml. The highest counts were at the point of discharge while the lowest counts were recorded for the upstream samples. The diversity of the microbial species was more in the wet season than in the dry season. The bacteria isolated during the dry season were Salmonella sp, E. coli, and Vibrio sp. In the wet season, the isolates included E. coli, Salmonella sp, Vibrio sp, Staphylococcus aureus, and Streptococcus faecalis. The wet season fungi isolates were Aspergillus fumigatus, Aspergillus niger, species of Penicillium and Rhizopus while the dry season isolates included Aspergillus fumigatus, Aspergillus niger and species of Penicillium. The results of the physicochemical analysis showed a pH range of 5.3 to 9.5 (a little below the optimum for aquatic organisms). Other physicochemical parameters such as organic matter content, turbidity, BOD5 and salinity particularly at the point of effluent discharge and downstream were higher during the dry season. The antibiotics susceptibility testing of the bacterial isolates revealed a multidrug resistant status for Staphylococcus aureus and Streptococcus faecalis. The plasmid profile of these multidrug resistant isolates was determined and results revealed that both isolates harboured plasmid of size 48.5 kb. Antibiotic susceptibility of the isolates when cured of plasmid revealed loss of resistance to over 75% of the antibiotics they were originally resistant to. The microbial and physicochemical properties of the river showed that it is unfit for human consumption. The plasmid mediated multidrug resistant status of some of the isolates is a threat to chemotherapy and is a cause for public health concern. Also, the microbial density is higher in the dry season and lower in the wet season while there are more microbial diversities in the wet season than in the dry season.

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