

**Human Health Risk Assessment of Potentially Toxic Elements (PTEs) in Water, Sediments  
and Tilapia Fish (*Oreochromis niloticus*) of Ogun River**

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and Applied Sciences, Lead City University, Ibadan, Oyo State, Nigeria**

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(MSc) in Environmental and Analytical Chemistry**

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### Certification

This is to certify that Oluwayemisi Idayat, AKINDELE with matriculation number LCU/PG/001348 carried out this research work titled “Health Risk Assessment of Potentially Toxic Elements (PTEs) in Water, Sediments and Tilapia Fish (*Oreochromis niloticus*) of Ogun River” in the Department of Chemical Sciences, Faculty of Natural and Applied Sciences, Lead City University, Ibadan, Oyo State, for the award of Master Degree in Environmental and Analytical Chemistry and that this has not been previously submitted.

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**Date**

### **Dedication**

This research is dedicated to Almighty God for his grace and mercy that see me through this programme.

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Though, the above institutions and persons have assisted in the process of this research work, I alone stand responsible for any error(s) that may be found in the research work.

## Abstract

Potentially Toxic Elements (PTEs) are ubiquitous especially in water bodies and they have tendencies to bio-accumulate and hamper human body metabolic and endocrinal processes. This study aimed to assess the levels of PTEs in water, sediments and tissues of Tilapia Fish (*Oreochromis niloticus*) samples of Ogun River and its human health risk assessment. Water, sediments and fish samples were collected seasonally to assess 8 selected PTEs (Cu, Zn, Ni, Pb, Mn, Fe, Cr and Cd) using Atomic Absorption Spectrophotometer, while the physico-chemical parameters were determined using standard methods. Highest water pH value of 7.86 was recorded during dry season while the lowest of 6.10 was for the wet season. Temperature ranged from  $26.59 \pm 0.17$  °C to  $27.27 \pm 0.72$  °C and  $26.47 \pm 1.05$  °C to  $26.77 \pm 1.10$  °C for dry and wet seasons respectively. The Electrical Conductivity (EC) ranged from  $13.84 \pm 4.38$   $\mu$ S/cm to  $36.67 \pm 29.51$   $\mu$ S/cm and  $13.84 \pm 4.67$   $\mu$ S/cm to  $47.21 \pm 32.86$   $\mu$ S/cm for dry and wet seasons respectively. Total dissolved solids (TDS) showed slight positive relationship with the electrical conductivity. The mean TDS ranged from  $53.50 \pm 10.21$  mg/L to  $57.25 \pm 9.74$  mg/L and  $23.00 \pm 4.62$  mg/L to  $40.00 \pm 2.58$  mg/L for wet and dry seasons respectively. Water, sediment and fish tissues samples were analyzed for Cd, Cr, Pb, Zn, Ni, Mn, Fe and Cu contaminations. Concentrations were compared with NIS, FEPA and WHO. However, Fe levels were highest in both surface water, sediment, and fish samples while Cu level was least in both sample locations. Cd, Cr, Ni, Fe, Mn and Pb exceeded the NIS, FEPA and WHO. Pb was the largest contributor to non-carcinogenic risks. Risk from the other PTEs followed the order Cd > Mn > Fe > Ni > Cu > Cr > Zn for children and Fe > Cd > Mn > Ni > Cr > Cu > Zn for adults. Hence, Ogun River is found to have an appreciable level of metal toxicity especially at lafenwa and alagada points.

**Keywords:** Metal Bioaccumulation, PTEs, Ogun River, Tilapia, Toxicity.

**Word Count:** 340

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## List of Acronyms

<b>Abbreviation</b>	<b>Meaning</b>
<b>AAS</b>	Atomic Absorption Spectrophotometry
<b>ADI</b>	Average Daily Intake
<b>BOD</b>	Biological Oxygen Demand
<b>COD</b>	Chemical Oxygen Demand
<b>CR</b>	Carcinogenic Rate
<b>DO</b>	Dissolved Oxygen
<b>EC</b>	Electrical Conductivity
<b>FEPA</b>	Federal Environmental Protection Agency
<b>GPS</b>	Global Positioning System
<b>HI</b>	Hazard index
<b>HQ</b>	Hazard quotient
<b>MDL</b>	Medical Diagnostic Laboratory
<b>NIS</b>	Nigerian Industrial Standard
<b>Ppm</b>	Part per million
<b>PTEs</b>	Potentially Toxic Elements
<b>SD</b>	Standard Definition
<b>SE</b>	Standard Error
<b>TDS</b>	Total Dissolved Solids
<b>TOC</b>	Total Organic Carbon
<b>USEPA</b>	United State Environmental Protection Agency
<b>WHO</b>	World Health Organizatio