

**Concentration and Human Exposure Assessment of Selected Heavy Metals and Parabens
in Indoor Dust from Selected Areas in Ibadan**

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

**In Partial Fulfillment of the Requirements for the Award of Master of Science (M.Sc.) in
Environmental and Analytical Chemistry**

Certification

This is to certify that Caroline Ebakhalumhe **IDOGAR** with Matric Number **LCU/PG/002943** carried out this research work titled “**Concentration and Human Exposure Assessment of Selected Heavy metals and Parabens in Indoor Dust from Selected Areas in Ibadan**” in the Department of Chemical Sciences (Chemistry Unit), Faculty of Natural and Applied Sciences, Lead City University, Ibadan, under my supervision for the award of Master of Science (M.Sc.) in Environmental and Analytical Chemistry and that this work has not been previously submitted.

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(Head of Department)

Date

Dedication

This work is dedicated to God for guiding me all through and seeing me to the completion of this program.

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Acknowledgement

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Even though the above-mentioned institutions and persons have assisted in the process of this research work, I alone stand responsible for the errors, if any, found in this work.

Abstract

Indoor dust from residential environments has been shown to retain harmful chemical pollutants, including parabens and heavy metals. Consequently, the quality of indoor dust, to which humans are regularly exposed, is a global concern for human well-being. However, in Nigeria, there is a lack of monitoring and risk assessment data on the co-occurrence of these chemical residues. For this study, heavy metals (Cu, Mn, Pb, Zn, Cr, Ni, and Cd) and parabens (MeP, EtP, PrP, and BuP) were quantified by Atomic Absorption Spectrometry and High-Performance Liquid Chromatography with an Ultraviolet detector, respectively. The results were validated through linearity ($R^2 > 0.999$) and recovery (99.6–101%) procedures. The concentrations and associated health risks of these selected heavy metals and parabens, along with their implications for human health, were assessed using indoor dust samples collected from several residential areas in Ibadan. Samples were gathered from twenty locations in the Southwestern part of Ibadan, Oyo State, Nigeria. The concentration of heavy metals varied considerably, with the highest mean recorded for Mn (17.14), followed by Zn (2.82), Cu (1.59), Pb (1.06), Cr (0.20), Ni (0.32), and Cd (0.01). Mn posed significant non-carcinogenic risks via inhalation, and these risks were higher for adults than for children. Cr and Ni exhibited considerable Target Carcinogenic Risks (TCR) through inhalation, with higher risks observed in adults. Similarly, the concentration of parabens varied, with MeP (2706.37) having the highest mean concentration, followed by EtP (887.21), BuP (861.09), and PrP (757.31). The Hazard Quotient and Hazard Index values for both children and adults were below 1, indicating low risk. A significant negative correlation was found between Cd and EtP, suggesting different sources. Overall, heavy metal contamination of indoor dust was classified as low. Nevertheless, the co-occurrence of toxic metals and parabens underscores the need for monitoring and preventive health measures.

Keywords: Indoor exposure, Dust particles, Health risk assessment, Toxic heavy metals, Parabens

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Table of Contents

Content	Page
Title Page	i
Certification	ii
Dedication	iii
Acknowledgment	iv
Abstract	v
Table of Contents	vi
List of Tables	xiv
List of Figures	xvi
List of Acronyms	xvii
Chapter One: Introduction	
1.1 Background to the Study	18
1.2 Statement of the Problem	20
1.3 Justification of the Study	21
1.4 Aim and Objectives	21
1.5 Research Questions	22
1.6 Significance of the Study	22
1.7 Scope of the Study	23
1.8 Limitations of the Study	23

1.9	Operational Definition of Key Terms	23
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Endnotes	25
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Chapter Two: Literature Review

2.1	Heavy Metals	29
-----	--------------	----

2.2	Origin of Heavy Metals	30
-----	------------------------	----

2.2.1	Natural Source	30
-------	----------------	----

2.2.2	Anthropogenic Source	31
-------	----------------------	----

2.3	Uses of Heavy Metals	32
-----	----------------------	----

2.3.1	In the Construction Industry	32
-------	------------------------------	----

2.3.2	In Electronics	33
-------	----------------	----

2.3.3	In Medicine	33
-------	-------------	----

2.3.4	Machinery, Refractory and Automobiles	33
-------	---------------------------------------	----

2.3.5	Decorative Products	34
-------	---------------------	----

2.3.6	Food and Drink Industry	34
-------	-------------------------	----

2.3.7	Paint Industry	35
-------	----------------	----

2.4	Exposure to Heavy Metals	35
-----	--------------------------	----

2.4.1	Environmental Exposure	36
-------	------------------------	----

2.5	Physiological Routes of Exposure	38
-----	----------------------------------	----

2.5.1	Inhalation Exposure	38
-------	---------------------	----

2.5.2	Dermal Exposure	39
2.5.3	Ingestion Exposure	40
2.6	Specific Heavy Metals and their Risks	41
2.6.1	Copper (Cu)	42
2.6.2	Manganese (Mn)	44
2.6.3	Lead (Pb)	46
2.6.4	Zinc (Zn)	48
2.6.5	Chromium (Cr)	50
2.6.6	Nickel (Ni)	52
2.6.7	Cadmium (Cd)	53
2.7	Trace Metal Exposure Pathways	55
2.8	Effect of Trace Metal on Human Health	56
2.8.1	Cadmium	57
2.8.2	Chromium	57
2.8.3	Lead	58
2.8.4	Copper	58
2.8.5	Zinc	60
2.8.6	Nickel	60

2.9	Parabens	60
2.10	Characteristics of Parabens	62
2.11	Structure of Parabens	65
2.11.1	Ethylparabens	65
2.11.2	Methylparabens	65
2.11.3	Propylparabens	66
2.11.4	Butylparabens	66
2.12	Physiochemical Properties of Parabens	66
2.13	Occurrence of Parabens	71
2.14	Application of Parabens	72
2.14.1	Food	73
2.14.2	Pharmaceuticals	73
2.14.3	Personal Care Products	74
2.15	Metabolism of Parabens	75
2.16	Legislation of Parabens	77
2.17	Estimated Daily Intake of Parabens	79
2.18	Exposure Pathway of Parabens	80
2.19	Human Health Impact of Parabens Exposure	80

2.20	Dust	83
2.20.1	Types of Dust	85
2.21	Indoor Dust	87
2.21.1	Sources and Composition of Indoor Dust	87
2.22	Role of indoor dust as a carrier of pollutants, including heavy metals and Organic compounds like parabens	89
2.23	Indoor Air Quality	89
2.24	Contaminants in Indoor Dust	92
2.25	Transfer of Heavy Metals and Parabens from Sources to Dust	93
2.26	Human Exposure Routes to Dust	94
2.27	Evidence of Exposure to Heavy Metals and Parabens through Dust	95
2.28	Factors Influencing Indoor Dust Contamination	96
2.29	Evaluation of Health Risk	97
2.30	Limitations of Previous Study and Research Needs	101
	Endnotes	102
	Chapter Three: Methodology	
3.1	Description of the Study Areas	138
3.2	Sample Collection and Preservation	140

3.3	Sample Pre-treatment	142
3.3.1	Sample Pre-treatment for Heavy Metals	142
3.3.2	Sample Pre-treatment for Parabens	142
3.4	Instrumentation Analysis	143
3.4.1	Heavy Metals Analysis	143
3.4.2	Analysis of Parabens	145
3.5	Reagents and Chemicals	145
3.6	Analytical Quality Assurance / Quality Control	146
3.7	Statistical Analysis	147
3.8	Human Health Risk Assessment for Heavy Metals	147
3.8.1	Non-Carcinogenic Risk Assessment for Heavy Metals	147
3.8.2	Hazard Quotient for Heavy Metals	149
3.8.3	Hazard Index for Heavy Metals	150
3.8.4	Carcinogenic Risk Assessment for Heavy Metals	150
3.9	Dust Pollution Assessment	152
3.9.1	Contamination Factor	152
3.9.2	Pollution Load Index	153
3.9.3	Index of Geo-accumulation	153
3.10	Health Risk Assessment for Parabens	154
3.10.1	Non-Carcinogenic Risk Assessment for Parabens	154

3.10.2	Hazard Quotient for Parabens	155
3.10.3	Hazard Index for Parabens	155
	Endnotes	156
 Chapter Four: Results and Discussions of Findings		
4.1	Elemental Concentrations of Dust Samples	161
4.2	Parabens Concentrations of Indoor Dust Samples	163
4.3	Bivariate Statistical Analysis of Targeted Analytes in Indoor Dust Samples	165
4.4	Multivariate Statistics Analysis	168
4.4.1	Principal component analysis (PCA)	168
4.4.2	Hierarchical cluster analysis (HCA)	170
4.5	Exposure and Human Health Risk Assessment of selected Embedded Heavy metals	175
4.5.1	Average Daily Dose for the Heavy Metals	175
4.5.2	Non-Carcinogenic Risk Assessment for the Heavy Metals	180
4.5.3	Carcinogenic Risk Assessment for Heavy Metals	186
4.6	Health Risk Assessment of Parabens in Indoor Dust Samples	188
4.6.1	Average Daily Dose for Parabens	188
4.6.2	Hazard Quotient and Hazard Index for Parabens	191
4.7	Dust Pollution Assessment	195
4.7.1	Contamination Factor (CF)	195

4.7.2	Pollution Load Index (PLI)	195
4.7.3	Index of Geo-accumulation (Igeo)	195
	Endnotes	198
	Chapter Five: Conclusion	
5.1	Summary of Findings	203
5.2	Conclusion	204
5.3	Recommendations	205
5.4	Contribution to Knowledge	206
5.5	Suggested Areas for Further Research	206
	Bibliography	207
	Appendices	251
	Biodata	254
	University Compliance Certification	257

List of Tables

Table	Title	Page
2.1	Molecular Structure of Parabens	68
2.2	Physicochemical Properties of Parabens	69
2.3	Parabens have limited solubility in Water	70
2.4	Estimated daily intake (EDI, ng per kg body weight per day) of parabens via ingestion of indoor dust among different populations)	100
3.1	Coordinates for the Sampling Sites	141
3.2	Elemental Wavelength, Curve Correlation Coefficient (R ²) and Validation of the digestion recovery and elemental analysis method using Soil certified reference materials)	144
4.1	Comparison of concentrations of Heavy metals with standard and other studies	162
4.2	Concentrations of Parabens in Indoor Dust Samples (ng g ⁻¹)	166
4.3	Correlation matrix for analytes in dust samples	169
4.4	Rotated component matrix for analytes in dust samples	171
4.5	Average Daily Dose for Heavy Metals in Children and Adults	175
4.6	Hazard Quotients (HQ _{ing} , HQ _{inh} , HQ _{derm}) and Hazard Indices (HI _{ing} , HI _{inh} , HI _{derm}) for Heavy Metals Exposure in Children and Adults	181
4.7	TLCR for Heavy Metals for Children and Adults	187
4.8	Average Daily Dose for Parabens in Indoor Dust for Children	189
4.9	Average Daily Dose for Parabens in Indoor Dust for Adult	190
4.10	Hazard Quotient and Hazard Index for Parabens for Children	192

4.11	Hazard Quotient and Hazard Index for Parabens for Adults	193
4.12	Comparison of Median Concentrations of Paraben in Indoor Dust with Previous Studies (ng g^{-1})	194
4.13	Assessment of Contamination Factor and Pollution Load Index for Heavy Metals in Indoor Dust	196
4.14	Igeo of Heavy Metals	197

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List of Figures

Figure	Title	Page
2.1	Pathways for Exposure and the Effects of Heavy Metals on Human Health	59
3.1	Map Illustrating the Locations of the Sampling Sites	139
4.1	Composition Profiles of the Studied Heavy Metals in Indoor Dust Particles	164
4.2	Composition Profiles of Targeted Parabens in Indoor Dust Particle	167
4.3	3-D Principal Component Analysis (PCA) Loading Plot (A) and Path Diagram (B) for Heavy Metals and Parabens in Indoor Dust Samples.	172
4.4	Dendrogram from Hierarchical Cluster Analysis Illustrating the Relationships Among Eleven Analytes in Indoor Dust Samples (the Distances Indicating the Level of Correlation Between Each Analyte).	174

List of Acronyms

Abbreviation	Meaning
AAS	Atomic Absorption Spectrophotometer
CDC	Center for Disease Control
PAHs	Polycyclic Aromatic Hydro Carbons
WHO	World Health Organization
USEPA	United States Environmental Protection Agency
HQ	Hazard Quotient
ADD	Average Daily Dose
HI	Hazard Index
HPLC	High Performance Liquid Chromatograph
UV/VIS	Ultra Violet Visible Spectrometer
IUPAC	International Union of Pure and Applied Chemistry
CSQG	Canadian Soil Quality Guidance