



# **The Effect of Chronic Aluminium Toxicity on Fungiform and Circumvallate Papillae of Albino Rat and the Possible Protective Role of Ginger Co-administration**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

{وَعَلَّمَكَ مَا لَمْ تَكُنْ تَعْلَمُ وَكَانَ فَضْلُ  
اللَّهِ عَلَيْكَ عَظِيماً} النساء 113

{وَيُسْقَوْنَ فِيهَا كَأْساً كَانَ مِزَاجُهَا  
زَنْجَبِيلاً} الإنسان 17

صدق الله العظيم

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## *Dedication*

*To my small precious family,  
My beloved Youssof, Yahia and Yassin,  
Thank you for your love, support, and for  
helping me finish this work.*

*My dear husband,  
I thank you from the deepest point of my  
heart for your tremendous efforts in this  
work and for your love and support.*

*To my beloved mother and father...this thesis  
is my gift for you...*

*To my beloved sister and brothers,  
My mother and father in law,*

*I'm deeply grateful for your love and support  
throughout this work, thank you so much.*

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## List of Abbreviations

Abbreviation	Meaning
+ ve	Positive
AChE	Acetyl Choline Esterase
Al	Aluminium
Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>	Aluminium sulphate
AlCl <sub>3</sub>	Aluminium chloride
Alum	Aluminium Sulphate
ATP	Adenosine Triphosphate
b.w	Body weight
Bi	Bismuth
c.t	Connective Tissue
Cd	Cadmium
Co	Cobalt
DNA	Deoxyribonucleic Acid
DPX	Distyrene Plasticizer in Xylene
EM	Electron micrograph
FAO	Food and Agriculture Organization
FG	Formaldehyde-Glutaraldehyde
GI	Gastrointestinal
GPX	Glutathione peroxidase
GSH	Glutathione
GST	Glutathione-s-transferase
H&E	Haematoxyline & Eosin

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Abbreviation	Meaning
Hg	Mercury
h	Hour
Kg	Kilograms
LPS	Lipo Poly Saccharide
MDA	Malon di aldehyde
Mn	Manganise
MT	Metallothioneins
Ni	Nickel
NO	Nitric Oxide
NPDFs	Nasal Polyp-derived Fibroblasts
OSO <sub>4</sub>	Osmium tetroxide
PCC	Protein Carbonyl Contents
PKC	Protein Kinase C
RNA	Ribonuclein Acid
ROS	Reactive Oxygen Species
SOD	Super oxide dismutase
TEM	Transmission Electron Microscope
TGFβ	Transforming Growth Factor β
WHO	World Health Organization
Zn	Zinc