THERAPEUTIC EFFECTS OF CALCIUM AND CALCIUM-D-GLUCARATE IN PROLONGED HIGH MONOSODIUM GLUTAMATE INDUCED ORGANS DAMAGE IN FEMALE RAT

ELUDIRE ABIDEMI TEWOGBOLA

18PCP02014

JUNE 2021

THERAPEUTIC EFFECTS OF CALCIUM AND CALCIUM-D-GLUCARATE IN PROLONGED HIGH MONOSODIUM GLUTAMATE INDUCED ORGANS DAMAGE IN FEMALE RAT

BY

ELUDIRE ABIDEMI TEWOGBOLA

18PCP02014

A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES OF COVENANT UNIVERSITY, OTA, OGUN STATE, NIGERIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE (M.Sc) DEGREE IN BIOCHEMISTRY IN THE DEPARTMENT OF BIOCHEMISTRY, COLLEGE OF SCIENCE AND TECHNOLOGY, COVENANT UNIVERSITY, OTA.

.

JUNE 2021

ACCEPTANCE

This is to attest that this dissertation is accepted in partial fulfilment of the requirement for the award of the degree of Master of Science in Biochemistry in the Department of Biochemistry, College of Science and Technology, Covenant University, Ota, Nigeria.

Mr. John A. Philip **…….**

(Secretary, School of Postgraduate Studies) Signature & Date

Prof. Akan B. Williams **…….**

(Dean, School of Postgraduate Studies) Signature & Date

DECLARATION

I, **ELUDIRE, ABIDEMI TEWOGBOLA (18PCP02014)** declares that this research was carried out by me under the supervision of Prof. I.S Afolabi of the Department of Biochemistry, College of Science and Technology, Covenant University, Ota, Nigeria. I attest that the thesis has not been presented either wholly or partly for the award of any degree elsewhere. All the sources of data and scholarly information used in this dissertation are duly acknowledged.

ELUDIRE ABIDEMI TEWOGBOLA **……**

Signature & Date

CERTIFICATION

We certify that this dissertation titled **'THERAPEUTIC EFFECTS OF CALCIUM AND CALCIUM-D-GLUCARATE IN PROLONGED HIGH MONOSODIUM GLUTAMATE INDUCED ORGANS DAMAGE IN FEMALE RAT' 'is an original research carried out by ELUDIRE, ABIDEMI TEWOGBOLA (18PCP02014)** in the Department of Biochemistry, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria, under the supervision of **Prof. I.S Afolabi** .We have examined and found the work acceptable as part of the requirements for the award of a degree of Master of Science in Biochemistry.

Prof. Israel S. Afolabi **…….**

(Supervisor) Signature & Date

Prof. Israel S. Afolabi **…….**

(Head of Department) Signature & Date

Prof. Joshua O. Ajele **……..**

(External Examiner) Signature & Date

Prof. Akan B. Williams **……..**

(Dean, School of Postgraduate Studies) Signature & Date

DEDICATION

I dedicate this research work to God Almighty for the grace to successfully complete this work. I want to also dedicate this to my parents, Mr. and Mrs. ELUDIRE and my brother Mr. Afolabi Eludire for their support and constant encouragement.

ACKNOWLEDGEMENTS

I will firstly like to appreciate the Almighty and all sufficient God, for the immense grace and privilege bestowed on me to complete this work. I exalt His name for divine inspiration and guidance.

I appreciate my supervisor, and the Head of department, Prof. I.S. Afolabi, my lecturers and laboratory staff, Mr. Adeyemi, Mr. Michael for their assistance, counselling and guidance .May the good Lord bless you all richly in Jesus' name.

Table of Contents

LIST OF PLATES

LIST OF FIGURES

Figures **Title of Figures** **Page**

LIST OF TABLES

Tables **Title of Tables** **Page**

LIST OF ABBREVIATIONS

LDH	Lactate dehydrogenase
AST	Aspartate transaminase
ALT	Alanine transaminase
CDG	Calcium d glucarate
MSG	Monosodium glutamate

ABSTRACT

Monosodium glutamate is a flavour enhancing agent in food processing with threats to public health at a high level. This study is aimed at evaluating the therapeutic effects of calcium, and calcium d glucarate (CDG) on excess monosodium glutamate (MSG) fed female rats. Ninety-six female rats, divided into 10 study groups consisting of the pre-treated and post-treated groups with 9 rats each, and additional 6 rats for baseline were used for this study. Animals in the group 1 and 2 of both pre and post-treatment group served as normal control, and those administered with 750 mg/kg bwt. of MSG intraperitoneally for 70 days respectively. Calcium (440mg/L), CDG (35 mg/kg), and the combined calcium and CDG based diets were respectively administered to groups 3, 4, and 5 of the two pre-treated and post-treated with MSG (750mg/kgbwt). Treatments administered for 14, 28, and 42 days were assessed for their effects on lactate dehydrogenase (LDH), β-glucuronidase, estradiol, and total protein in the serum using appropriate kits. The total protein levels, and the activities of alanine transaminase, aspartate transaminase, in addition to histological examination, were also assessed in the liver, kidney, small intestine, and uterus. The 28 days pre-administration of calcium-d-glucarate as a lone diet increased significantly ($p < 0.05$) the estrogen level in the rats. The 14 days post-administration of diets composed with calcium, and the calcium-d-glucarate significantly increased ($p < 0.05$) estrogen level, these two diets significantly reduced ($p < 0.05$) estrogen level for the remaining period of experimentation, while the combined diets significantly reduced ($p < 0.05$) the estrogen level throughout the experiment. Both the pre-treated and post-administered calcium-d-glucarate diets significantly reduced ($p<0.05$) the activity of β-glucuronidase. Also, the 14 days pre-administered calcium diet significantly reduced ($p<0.05$) the activity of serum alanine transferase. Both the pre-administered calcium and the combined diets significantly reduced ($p < 0.05$) the LDH activities in the first 28 days of feeding, while the post-administered calcium and calcium-d-glucarate significantly increased ($p<0.05$) the activities of LDH during the first 28 days feeding. Histology results showed calcium and calcium-d-glucarate were able to extensively reduce the damage in organs. Therefore, foods fortification with both calcium and calcium-d-glucarate are recommended strategies for managing health hazards due to excessive consumption of monosodium glutamate**.**

Keywords: Calcium d-glucarate, Monosodium glutamate, Calcium.