Assessment of Neurotoxicity of the Synthetic Coloring Dye (Erythrosine) in Rats

Thesis

Submitted for Partial Fulfillment of Master Degree in Biochemistry

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Department of Environmental Basic Science
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2019

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A Thesis Submitted in Partial Fulfillment
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The Requirement for the Master Degree
In
Environmental Sciences
Department of Environmental Basic Sciences

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Dedication

This work is dedicated to ..

My Beloved Father and Mother, to whom I owe everything I ever did in my life or will achieve. And for always being there for me.

My Husband and My Lovely Children.

My Brother , My Sister and all my Family for their support.

سورة البقرة الآية: ٣٢

Acknowledgment

No words can ever express my sincere gratitude to **Allah,** *who guide, aid and bless me in everything and everywhere in my life*

I'd like to express my respectful thanks and profound gratitude to ***Prof. Dr. Magdy Mahmoud Mohamed,*** *Professor of Biochemistry - Faculty of Science - Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I would like to express my deepest thanks to ***Dr. Maha Moustafa Kamal,*** *Assistant Professor of Biochemistry- Faculty of Science - Ain Shams University for her encouragement, creative and comprehensive advice until this work came to existence.*

I am also delighted to express my deepest gratitude and thanks to ***Dr. Omayma Mohamed Hassanin,*** *Associate consultant of Clinical & Chemical Pathology, Molecular biology Department, Faculty of Medicine, Ain Shams University, for her kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

My sincere pleasure for my colleagues of Medical Genetics Center Ain Shams University for their help and support during the study.

Marwa Gouda Bayommi

Abstract

Food additives are substances used in food industry in order to improve the food's taste, appearance by preserving its flavor and preventing it from souring. Food additives are added to the most junk and fast foods, especially food for kids. Erythrosine B (ErB) is a cherry-pink food colorant with a polyiodinated xanthene structure. It is unique in this class approved by the US Food and Drug Administration (FDA) and is widely used in foods, drugs and cosmetics. Although its utilization is permitted, ErB has been described as having an influence on childhood behavior and interfering with thyroid function due to the high iodine content. This study was designed to investigate the toxic effect of two doses (low dose of 0.08mg/kg animal B.wt., and 0.4 mg/kb animal B.wt) of ErB as synthetic colors on the balance of neurotransmitter in 30 treated male rats compared with the 15 control male rats. Significant decrease (p□0.01) was obtained in dopamine, gamma amino butyric acid (GABA), norepinephrine (NE), acetyl choline esterase (AchE), glutathione reductase (GSH) and serotonin when treated with low and high dose ErB compared with the control group. Significant increase (p□0.01) in Malondialdehyde (MDA) and Glutamate in low and high dose.

Keywords: Neurotoxicity, Coloring dye, Erythrosine B, oxidative stress

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List of Abbreviations

Abb.	Full term
5HT	*5-hydroxytryptamine*
Ach	*Acetylcholine*
AchE	*Acetyl Choline Esterase*
ADHD	*Attention Deficit Hyperactivity Disorder*
ADI	*Acceptable daily Intake*
BW	*Body Weight*
CAS	*Chemical Abstract Service*
CNS	*Central Nervous System*
DA	*Dopamine*
DTNB	*Dithiobisnitrobenzoic*
ErB	*Erythrosine B*
EU	*European Union*
FDA	*Food and Drug Administration*
FSANZ	*Food Standards Australia New Zealand*
GABA	*Gamma Amino Butyric Acid*
GIT	*Gastrointestinal Tract*
GMP	*Good Manufacturing Practice*
GSH	*Glutathione Reductase*
HPLC	*High Performance Liquid Chromatography*
INS	*International Numbering System*
MDA	*Malondialdehyde*
MPA	*B-mercaptopropionic Acid*
MPLs	*Maximum Permitted Levels*
NE	*Nor epinephrine*
NMJ	*Neuromuscular Junction*
OCD	*Obsessive Compulsive Disorder*
OPA	*O-phthaldialdehyde Acid*
PNS	*Peripheral Nervous System*
PUFAS	*Polyunsaturated Fatty Acids*

List of Abbreviations (Cont...)

Abb.	Full term
RP-HPLC	*Reversed-phase high performance liquid chromatography*
TBA	*Thiobarbituric Acid*
TEA	*Triethanoamine*
THF	*Tetrahydrofuran*
US	*United kingdom*
WHO	*World Health Organization*

INTRODUCTION AND AIM OF THE WORK

Artificial food colors have been utilized over the century for esthetic that make the foods attractive and stimulate appetite, however, in developing countries there has been a sharp increase in the use of synthetic food coloring agents. In the past years there is an uncontrolled use of synthetic color particularly in food mostly consumed by children. Therefore, more attention must be focused on the physiological and pathological effects of color additives. Worldwide, the use of colors in food faced with controversy, especially in children nutrition when added to food at high doses **(Khiralla *et al.*, 2015).**

The color of food products is extremely important because it influences directly the perception of both the flavor and quality of a food product and improves its properties, especially when processed food loses an attractive appearance due to high temperature or enzymatic modification **(Burrows, 2009).**

With the great increase in the use of food additives, there also has emerged considerable scientific data linking food additive intolerance with various physical and mental disorders, particularly with childhood hyperactivity and hypersensitivity **(Wróblewska, 2009).**

Processed foods usually contain additives of some sort. The hypothesis that some of these additives can cause behavior and attention problems is continuously discussed. Prevalence of food additive intolerance in children is estimated at 1 to 2% and is mainly found in atopic children in whom the additive