BIOCHEMICAL AND MOLECULAR STUDIES ON SOME SYNTHETIC FOOD ADDITIVES

By

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B. Sc. Agric. Sci. (Agriculture Biochemistry), Fac. Agric., Cairo Univ., 1998
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THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

In

Agricultural Sciences

(Agricultural Biochemistry)

Department of Agricultural Biochemistry
Faculty of Agriculture
Cairo University
EGYPT

2011

APPROVAL SHEET

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SUPERVISION SHEET

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Name of Candidate: Radwa Adel Younis El Baz **Degree:** Ph.D.
Title of Thesis: Biochemical and Molecular Studies on Som e Synthetic Food Additives
Supervisors: Dr. Ahmed Mahmoud Moustafa Aboul-Enein
Dr.Ebtesam Abdel-Moneim Mahmoud Hassanien
Department: Agricultural Biochemistry **Approval: 24 / 3/ 2011**

ABSTRACT

In the present study haem atological, biochem ical, histological, m olecular and *in vitro* studies were carried out to evaluate the effect of synthetic and natural food additives in either their si ngle or two fold treatment dose to prove their effect on the biological and physiological behavior in experimental rats. Na saccharin was used as synthetic sweetener in comparison to sorbitol. Tartrazine was exam ined as synthetic colorant in comparison w ith carm ine as natural one. BHT which was tested as sy nthetic preservative and vanillin was exam ined as synthetic flavor in comparison with clove oil tested as natural preservative and flavor. Results showed a pronounced increase in RBCs count and Hb levels under the influence of sy nthetic food additives while , no significant changes occur when natural food additives we re exam ined . A significant decrease occurred on WBCs count when tars fed on sy nthetic additives in com parison with their natural ones.

Synthetic food additives leads to a severe increase in AST, ALT activities when com pared to their controls while no observed increase were noticed by using natural ones. Sy nthetic food additives affect the enzy matic symphony in the body , causing a lot of disturbances and unbalance in the enzymatic reactions which act as an indi cator for several diseases. Significant increase in creatinine, uric acid and bilirubin levels were detected. In addition, severe increase occurred on gam ma-glutamyl transferase and alkaline phosphatase activities which recorded great increase on m ale rats when administered sy nthetic food additives in either its single or 2-fold dose administration in comparison with their natural ones.

Histological examinations was carried out for different organs. Liver, kidneys and spleen of tested male adult rats were taken after decapitation at the end of the experim ent and fixed in 10%neutral buffered form alin for 24h.The tissues washed and prepared for subsequent examination.

Molecular analysis occurred at the end of experiment and two rats of each group w ere injected intraperitoneal by colchicine 2h prior to sacrifice by decapitation. The bone m arrow cells were collected from the fem ora and the different types of chromosomal aberrations were studied. Additionally, the effect of food additives either natural or sy nthetic were tested *in vitro* on the viability of tumor cells (EACC) and the results were recorded. Results proved that natural food additives have antitumor activity against tumor cells.

Key words: Synthetic food additives, natural food additives, health hazard effect, blood count, histological examination, molecular analysis.

DEDICATION

I dedicate this work to whom my heart felt thanks; to my Father Consultant/Adel Younis El-Baz, my mother Professor/Nasiba Kohela, my lovely kids Zien, Karim and Radwa, for their patience, help and support they lovely offered along the whole period of my study.

ACKNOWLEDGEMENT

*I am deeply thankful for merciful **ALLAH** who gave me everything I ask and by the grace of whom the work was realized.*

*I wish to express thanks and gratitude to **Dr. Ahmed Mahmoud Moustafa Aboul-Enein** Professor of Biochemistry, Faculty of Agriculture, Cairo University for his supervision, encouragement and constructive criticism during the thesis.*

*Sincere thanks to **Dr. Ebtesam Abdel-Moniem Mahmoud Hassanien** Professor of Biochemistry, Faculty of Agriculture, Cairo University for her effort,helpful advice, care and support in all stages of the thesis.*

I greatly thank all the members of Biochemistry Department Faculty of Agriculture, Cairo University for the facilities they offered me during my practical work.

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INTRODUCTION

Increasing attention has been paid for the role of food additives either natural or synthetic. In the second half of the twentieth century was the wide spread use of color food additives. More than 3000 artificial synthetic food additives including 1200 artificial food colorants were used in food.

In recent years it has been recognized that some synthetic food additives have toxic properties and irreversible adverse effects on human health especially when used for a long time. They showed to exhibit genotoxic effect depending upon the level of human exposure to such agents and lead to a lot of hazard effects on human health and experimental animals (Dawidek-Pietryka and Dudkda , 2002).

Food additive is any substance not commonly regarded or used as food which is added to , or used in or on food at any stage to affect its keeping quality, texture, conistancy, taste, color, alkalinity or acidity, or to serve any other technological function in relation to food and include processing aids(Magnuson *et al*. , 2007) .

Food additives have several uses as preservatives, sweeteners, flavors, enhancers, food colorants, color - retention agents, bulking agent, thickners, emulsifiers, anti - foaming agents, anti - caking agents and flavor treatment agent. They were used in soft drinks industry, dried fruits, juices, syrups, cherries, children sweets, salad cream, jams, crisps, biscuits, sauces, corned beef, other food and meat products (Birkner *et al*., 2006).

The growth in use for these additives had increased enormously in the last 50 years. An emerged considerable scientific data linking food additives intolerance with various physical and mental disorders, especially artificial azo dyes used as food colorants. The extent of such use was related to the degree of industrialization.The consequence of industrialization and the development of food processing technology were detected and the great bulk of artificial food additive used in food had been suspected of being toxic and carcinogenic. Many of these additives had been banned whenever possible to choose food without synthetic additives (Hirschbruch and Torres, 1998).

Additionally, artificial food additives induced colon DNA damage in mice. It had become obvious that exposure to chemicals entails risk. Their hazardous and threatening may be not only direct but indirect affecting microorganisms, animal and plants (Tsuda *et al.*, 2001).

Continuous consumption of synthetic food additives was related to several diseases as heart disease, liver, kidney, brain damage, weakened immune system, infertility, hyperactivity in children, behavioral problems, learning, visual disorders and cancer (Ruxton, 2008) .

Nowadays, people prefer using natural food additives, herbal additives and even biological farming without using any synthetic compounds. All these occur due to the excessive use of synthetic food additives which lead to human health hazard. Increasing restrictions had been focused on the utilization of natural products as source of fine chemicals for various uses. It was well established that a large number