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The Physiological Effects of A Food Additive on Male Albino Rats

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٢٠١١

CONTENTS

CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

According to the Food Protection Committee of Food and Nutrition Board, food additives may be defined as substances or a mixture of substances, other than the basic food-stuffs, which are found in the foods as a result of any aspect of production, processing, storage or packaging.

Food additives are classified into six major categories: preservatives, nutritional additives, flavoring agents, coloring agents, texturizing agents, and miscellaneous additives.

Food additives are used for various purposes, including preservation, coloring or sweetening. The wide range of food additives, running into more than ٢٥٠٠ items used to preserve, dye or enhance foods are a consequence of industrialization and the development of food processing technology.

Most coloring agents are used to improve the overall attractiveness of food. A number of natural and synthetic additives are used to color foods. Although synthetic coloring agents are continued to be used extensively, there has been a concomitant significant increasing interest concerning the using of natural colorants.

Azo dyes are one of these food additives which widely used as food colorants. They account for approximately ٦٠-٧٠٪ of all dyes used in food and textile manufacture.

Azo dyes are much more stable than most of the natural food dyes. They are stable in the whole pH range of foods, are heat stable and do not fade when exposed to light or oxygen. This makes azo dyes applicable in nearly all foods.

Despite the benefits attributed to food additives, for several years there have also been a number of concerns regarding the potential short- and long-term risks of consuming these substances. Criticisms of these food additives are concerned with both indirect and direct impacts of using them.

More attention was focused on the pathophysiological effects of coloring additives. The biochemical and histopathological examinations of the toxic effects of synthetic dyes were tested. There has been an extensive ongoing research on the deleterious effects induced by synthetic food coloring agents in rats **(Abu El-Zahab *et al.*, ١٩٩٧; Mekkawy *et al.*, ١٩٩٨; El-Shamy *et al.*, ١٩٩٩; Marie *et al.*, ١٩٩٩; Helal *et al.* ٢٠٠٠; Paumgartten *et al.*, ٢٠٠٢; Kitamura *et al.*, ٢٠٠٣; Bautista *et al.*, ٢٠٠٤ and Attia *et al.*, ٢٠٠٥).**

Amaranth (FD&C Red No.٢) is one of the most widely tested dyes, which used in food, drugs, soft drinks, jellies, sweets and cosmetics.

Some studies have suggested that amaranth, is carcinogenic in rats **(Willheim and Ivy, ١٩٥٣ and Andrianova, ١٩٧٠)** and affects their reproduction **(Collins and McLaughlin, ١٩٧٢; Collins *et al.*, ١٩٧٣ and Collins et al., ١٩٧٥a, b**).

Amaranth is also considered as teratogenic agent to small mammals such as mice or rats and was banned by the United States Federal Drug Administration in ١٩٧٦ for use in drugs, cosmetics, or foods. The International Agency for Research on Cancer (IARC) suggests that there is no enough evidence to conclusively state that amaranth is a human carcinogenic.

AIM OF THE WORK

The present work is aimed to carry out several haematological and biochemical investigations on male albino rats to study the various effects of a synthetic food colorant agent (amaranth), which present on a wide-scale basis in the food-market industry.

REVIEW OF LITERATURE

Recently, there is a sharp increase in the use of the synthetic food coloring additives, especially in commercial beverages that are consumed by children. More attention was focused on the pathophysiological effects of coloring additives. The biochemical and histopathological examinations of the toxic effects of synthetic dyes were tested. There has been an extensive ongoing research on the deleterious effects induced by synthetic food coloring agents in rats.

Willheim and Ivy (١٩٥٣) stated that, at a level of ٤٪ of amaranth in the diet was fed to five male and five female rats for periods up to ١٨ months, gross staining of the glandular stomach and small intestine was observed. Granular deposits were noted in the stomach, small intestine and in some cases in the colon. Also, a lymph sarcoma was observed.

Lockey (١٩٥٩) described three patients who gave a history of developing a rash after ingesting yellow-color-coded medications. The author conducted unblinded challenges with dilute solutions of tartrazine and concluded that the itching and other subjective complaints, which the patients experienced over the next few hours, were evidence of allergic reactions to tartrazine.

Carson (١٩٦٢) mentioned that six groups (nine rabbits of each) were used in dermal irritation and percutaneous toxicity tests employing ٠,١٪ and ١٪ amaranth in ointment or water vehicle. No significant dermal or systemic toxicity related to treatment was seen.

After a prolonged administration of a daily dose of ٥٠ mg/rat of amaranth, vitamin A content of the liver showed a threefold to fourfold decrease. The glutathione content of the liver and spleen was increased **(Galea, ١٩٦٢)**.

Sarcomas of the peritoneum and intestine were observed in ١١/١٨ rats receiving amaranth paste in the diet at a concentration of ٢٠,٠٠٠-٤٠,٠٠٠ mg/kg **(Baigusheva, ١٩٦٨).** Also, the author reported that one group of ٥٠ rats was fed a diet containing amaranth paste for ٢٥ months, at dietary levels ranged from ٠,٨٪ to ١,٦٪ amaranth. Tumors of the peritoneum and intestine began to appear in ١٨ survivors at ١٩ months. By ٢٥ months a total of ١١ tumors were found. All tumors were histologically malignant **(Baigusheva, ١٩٦٨)**.

Fifteen malignant tumors were observed in ١٣/٤٨ rats fed a diet containing ٢٠,٠٠٠ mg/kg of pure amaranth for ٣٣ months **(Andrianova, ١٩٧٠)**.

Groups of one male and four female rats of each fed diets containing ١,٥ and ١٥ mg/kg b.w. /day of amaranth were