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The Physiological Effects of A Food Additive on Male Albino Rats

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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 2000 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 60-70% 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.*, ۱۹۹۷; Mekkawy *et al.*, ۱۹۹۸; El-Shamy *et al.*, ۱۹۹۹; Marie *et al.*, ۱۹۹۹; Helal *et al.* ۲۰۰۰; Paumgartten *et al.*, ۲۰۰۲; Kitamura *et al.*, ۲۰۰۳; Bautista *et al.*, ۲۰۰۴ and Attia *et al.*, ۲۰۰۵).**

Amaranth (FD&C Red No.۲) is one of the most widely tested dyes, which used in food, drugs, soft drinks, jellies, sweets and cosmetics.

References

Some studies have suggested that amaranth, is carcinogenic in rats (**Willheim and Ivy, 1953 and Andrianova, 1970**) and affects their reproduction (**Collins and McLaughlin, 1972; Collins *et al.*, 1973 and Collins *et al.*, 1975a, 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 1976 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 (1953) stated that, at a level of 4% of amaranth in the diet was fed to five male and five female rats for periods up to 18 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 (1969) 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 (1962) mentioned that six groups (nine rabbits of each) were used in dermal irritation and percutaneous toxicity tests employing 0, 1% and 1% 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 0.5 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, 1962**).

Sarcomas of the peritoneum and intestine were observed in 11/18 rats receiving amaranth paste in the diet at a concentration of 20,000-40,000 mg/kg (**Baigusheva, 1968**). Also, the author reported that one group of 0.5 rats was fed a diet containing amaranth paste for 20 months, at dietary levels ranged from 0.8% to 1.6% amaranth. Tumors of the peritoneum and intestine began to appear in 18 survivors at 19 months. By 20 months a total of 11 tumors were found. All tumors were histologically malignant (**Baigusheva, 1968**).

Fifteen malignant tumors were observed in 13/48 rats fed a diet containing 20,000 mg/kg of pure amaranth for 22 months (**Andrianova, 1970**).

Groups of one male and four female rats of each fed diets containing 1.0 and 10 mg/kg b.w. /day of amaranth were