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A Biochemical Study of Food Dye Tartrazine,Its effects on Swiss Albino Mice

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ABSTRACT

Tartrazine a colorant is being used most commonly as food colorant in confectioneries, drugs and cosmetics. The present study was designed and performed to evaluate the toxic effect of Tartrazine, a widely used azo dye on Swiss Albino Mice. Experimental animals were treated with tested dye at dose levels 100mg/kg/b.w. and 200mg/kg/b.w. alongwith normal diet. Present study revealed a highly noticeable increase in body weight gain of mice at both dose levels (11.18 -16.14%) as compared to control group. A significant variation in the average weight of kidney, liver, and testes were decrease in both doses as compared to control group of mice. Organ weight and Acid Phosphatase, Alkaline Phosphatase, SGOT, SGPT, were significantly increased in both Tartrazine consumed experimental groups. From the present study it is concluded that Tartrazine adversely alters biochemical parameters in Tartrazine fed mice. The outcome of study will help us to make a decision in using Tartrazine as food dye.

Figure : 00 References : 43 Tables : 03
KEY WORDS : Biochemical Parameters, Swiss albino Mice, Tartrazine food dye.

Introduction

Tartrazine is a counterfeit yellow azo color having trisodium salt of 3-carboxy-5-hydroxy-1 (p-sulfophenyl) - 4-(sulfophenylazo) pirazolone. It is generally utilized as colorant in biting gum, jams, puddings, juices, soft drinks, medications and beauty care products. Since it is a nitrous subordinate (azo class), it changes to a sweet-smelling amine in the creature which is profoundly sharpening. The primary metabolite recognized to date is sulfanylic corrosive[10,21].

Food colorants are materials of natural origin, have been used to provide colour in food, drugs, cosmetics for thousands of years. Ash from fire mineral compounds and plants were probably among the materials used for cosmetic purposes[13].

By the mid 1995 characteristic and manufactured shading subsidiaries were utilized broadly to shading nourishments, drugs and so forth[15]. Shading is a significant attribute and determination rules for food decision. Late investigations have featured this significance and have demonstrated how choice may change among specific populaces and additional time[11].

Many products contain Tartrazine like food cotton, candy (soft- drinks, nahchos *etc.*), Some of non – food products include tartrazine such as soap, shampoos, *etc.* also some medicinal preparations contain tartrazine such as vitamins , antacids, medicinal capsules. The ADI for Tartrazine is 7.5 mg/kg/per day[43].Colours in food constitute an essential part of our life. Several years ago, the technology for processing food changed completely[30].

In present study, we report sub-chronic toxicity of dye on general health and biochemistry of Swiss albino mice.

Materials and Methods

Test Material: Tartrazine CA.S. No – 1934-21-0

Test Animal: 4 weeks old male Swiss albino mice *Mus musculus* L.

Experimental Design

Animals reared in the animal house under standardized conditions as per recommendations of Institutional Ethical Committee (1678/GO/a/12/CPCSEA) were divided into 3 groups each with 5 animals and were kept individually in the polypropylene cages. Two doses of dye were given orally mixed with the drinking water for 72 days as detailed below.

Group 1 (As Control Group): Standard feed + potable water

Group 2 (As Tartrazine treated Group)

(A) Standard Feed + Potable water mixed low dose of Tartrazine (100 mg/kg /b.wt.)

(B) Standard Feed + Potable water mixed high dose of Tartrazine (200 mg/kg /b.wt.)

TABLE-1. Effects on feed and water intake, and body weights of Swiss albino mice after sub - chronicexposure at 2 doses of (Dye)tartrazine (mg/ kg/body weight).

Parameters	Control	Treatments 100mg	200mg
Feed intake (g)	7.8±1.71.96	7.2±3.3 (-7.5%)	8.2±6.9 (12.9%)
Water intake (mL)	7.9 ± 2.4	7.8±2.3 (-1.4%)	8.1±3.9 (2.8%)
Body weight (g)	32.2±1.5	35.8±0.8* (11.2%)	37.4±0.5* (16.1%)

Data in parenthesis represent % change in the values in comparison to control. Significant at 5%*

After the 72 days of exposure, autopsy of animals were done by cervical dislocation. Cardiac blood was collected in the vials containing sodium salt of ethylene diamine tetra acetic acid (EDTA). Biochemical parameters analyzed were; Alkaline phosphatase, Acid phosphatase,SGOT, SGPT.

The data expressed as Mean± SEM were also subjected to Student's t-test using SYSTAT computer program version 5.0 to find significant difference between values of various parameters recorded for control and treated animals.

Result

Dye exposure altered feed and water intake of the mice. Compared with control, feed intake of mice decreased (7.5%) after exposure to low dose of dye, but increased (12.9%) in mice exposed to higher dose. The water intake was however, not affected (Table 1). Dye exposure however, increased body weights of mice (Table 1). The percentage increase in body weights was higher at higher dose (16.1%)in comparison to mice exposed at lower dose (11.2%) and may be related to increase in water retention in the body due to malfunction of kidney.

Organ weight:

The liver weight decreased in both low and high doses (-15.81- 16.60%) in comparison to control groups.

Weight of Kidney has been decreased in both low and high dose groups (-8.80 - 23.71%) in comparison to control mice.

A decrease in values of Testes weight were noted in both low and high dose fed animals that is (58.83) and (37.33%) respectively in comparison to control. (Table-2).

Effects on Biochemistry

Result study reveals that levels of Acid Phosphatase , Alkaline Phosphatase, SGOT, SGPT, increased significantly in both low(100mg/kg/ b.w.) and high doses (200mg/kg/b.w.) treated groups. In present study increase in Acid Phosphatase value (60-175%) has been observed in both low (100mg/kg/b.w.) and high doses (200mg/kg/b.w.) fed Tartrazine in Swiss Albino Mice when compared to control group of mice.

SGOT (U/L): Elevated SGOT values were noted in low (352.91%) and high (338.23%) doses of Tartrazine fed mice as compared to control group.

SGPT (IU/L): Both low and high dose fed mice exhibited a significant increase in serum SGPT value

TABLE-2 : Effects on organ weights of Swiss albino mice after sub chronic exposure at 2 doses of tartrazine (mg/kg/body weight)

S.No.	Organs	Control	LD (100mg/kg/b.w.)	HD (200mg/kg/b.w.)
1.	Liver(g)	2.794 ± 0.025	2.352 ± 0.283 *(-15.81%)	2.330 ± 0.205 (-16.60%)
2.	Kidney(g)	0.409 ± 0.010	0.373 ±0.048 (-8.80%)	0.312 ±0.008 (-23.71%)
3.	Testes(g)	0.758 ± 0.179	0.312 ±0.210* (-58.83%)	0.475 ±0.241 (-37.33%)

Data in parenthesis represent % change in the values in comparison to control. Significant at 5%*

TABLE-3: Effects in biochemistry of Swiss albino mice after subchronic exposure at 2 doses of tartrazine (mg/kg/body weight)

Parameters	(Control group)	LD(100mg/kg)	HD (200mg/kg)
Acid phosphatase(IU/dl)	0.800 ± 0.158	1.280±0.192 *(+60%)	2.200± 0.158*** (+175%)
Alkaline Phosphatase(IU/dl)	282.000 ± 1.581	382.800±1.924*** (+35.74%)	392.000±1.581*** (+39.00%)
SGOT(U/L)	34.000 ± 1.581	154.000 ± 1.581 *** (+352.91%)	149.000±1.581*** (+338.23%)
SGPT(U/L)	38.000 ± 1.581	142.000±1.581*** (+273.68%)	163.800 ± 1.924*** (+331.05%)

Data in parenthesis represent % change in the values in comparison to control. Significant at 5%*

(273.68- 331.05%) when compared to control group. (Table-3)

Discussion

Tartrazine presentation expanded feed admission of mice at higher portion yet their body loads expanded at both lower and higher portions (Table 1). Our discoveries are in concurrence with different laborers revealed increment in body loads of the trial creatures presented to male sprague-dawley rodents Sunset yellow[39], organization poisonousness investigation of tartrazine in Swiss albino mice[25], 4 built food and prescription Colorants[28], chocolate brown colored[32], orange red[37], malachite green[8], apple green[33], orange G[7], tomato red[33,36] and lead chromate[9]. There was significant augmentation in the body weight Kesari powder[34], the unfriendly impacts of food azo colors on rodents[12].

Tartrazine presentation diminished estimations of mice organ loads at both lower and higher portion (Table-2) e.g. liver, kidney testicles weight like introduction tartrazine[17] Tartrazine[35]. Chocolate Brown Dye in Swiss albino mice[31], organization harmfulness investigation of tartrazine in Swiss mice[25]. Decrease in ovaries weight at both the portion levels of kesari powder[34].

Soluble phosphatase, Acid phosphatase SGOT, SGPT expanded in both low and high portion introduction of tartrazine on swiss albino mice;Increase same outcome discover tartrazine[8] Tartrazine[4,21], Sunset Yellow, Tartrazine and Brilliant Blue[2], Fast green[30], Tartrazine[4], Allura[23], ALP expanded presentation tartrazine[19], allura red[3], Tartrazine, Chocolate earthy colored manufactured shading and turmeric, cocoa as a characteristic shading, expanded in the degree of ALP with tartrazine and chocolate earthy colored while contrasted with control gathering[30]. ALP expanded presentation Azo color Carmoisine[24], the egg whites levels, AST, ALT, and ALP esteems were essentially expanded in bunches[39].

Dissolvable phosphatase, destructive phosphatase, practices has been extended in totally treated social events. Extended development of destructive phosphatase in bundle treated with curcumin, carotin, and curcumin respectively.This study agreed with the earlier revealations[22] which found a basic addition in acid neutralizer phosphatase activity for unbelievable blue shading and attributed that to the deformation in liver limit.

Dissolvable phosphatase, egg whites, serum Creatinine, urea, uric destructive obsession, increased in male and female mice treated with tartrazine[25].

Malachite green and Pyceze gather in Heteropneustes fossilies. The levels of SGOT, SGPT, increased by and large at 24 and 96h on both malachite green and pyceze which is in agreement. Uric destructive, Acid neutralizer phosphatase increased essentially fast green treatment to rodents[40]. The liver protein is customary found in smaller amount considering hepatic turn of events and fix simultaneousness with concentrate, harmful effects of produced food colorants on male rodents[22].

Augmentation in serum basic phosphatase activities and egg whites, supreme Bilirubin, serum urea, and Creatinine for all treated social events treated with designed colorants or flavor included substances and appeared differently in relation to control get-togethers.

Late result on our examination were dissolvable phosphatase, SGOT, SGPT, globulin. Decay on a very basic level raised. Effect of Tatrazine in female swiss pale cleaned individual mice, study saw that are Alkaline phosphatase extended levels[9].

Effect of Tartrazine on destructive and stomach settling agent phosphatase in the liver of pale cleaned individual rodents[20]. Destructive Phosphatase and Alkaline phosphatase are extended in the liver of both male and female pale cleaned individual rodents after prologue to sub savage and part for 28 days.

Fundamental phosphatase occurs in the canalicular and sinusoid layer of the liver thus damage the liver and will achieve raised serum (AlP activity). Cholestatic liver disease characteristized by extended level of ALP joined with raised degree of Bilirubin. The example pf ALP, basically increase gave a marker that the hepatic furthest reaches the liver is awfully affected by tartrazine, sodium benzoate and MSG[18]. Essential phosphatase has a spot with a get-together of protein that catalyzes the hydrolysis of phosphomonoestress at stomach settling agent pH and it is accessible in the surface in most human tissue[5,14,27].

The basic augmentation in ALP development may be a result of impediment of cholestasis[38]. Similarly found that some food included substances are hydrophobic azo hues shown to be risky causing tumors in the liver and urinary bladder of rodents.

Stomach settling acid phosphatase has a couple of physiological limit in bone cells it parts inorganic phosphate from normal phosphate which is an extreme inhibitor of mineralization[22]. Extended level of destructive phosphatase activity in liver may be added to the physiological changes in the liver and addition in the general liver burden by food included substances in the assessment. Changes in layer vulnerability may cause labilization of lysosomal film with the appearance of impetus, in like manner raising the degrees of destructive phosphatase in the liver of viewed rodents as point by point[1,20]. Moreover in the liver, alkaline phosphatases are found histochemically in the microvilli of bill canalicull and on the sinusoidal surface of hepatocytes[41].

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