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Impact of di-n-butyl phthalate on haematology and biochemistry of albino rat

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Abstract

Di-n-butyl phthalate is a low volatile chemical added to plastic, paint, glue, hair spray, toys and house hold products. Human being and animal are exposed to di-n- butyl phthalate through air, water and food contamination in the environment. For present study, a group of six infection free rats were acclimatized under laboratory condition and divided in to two groups three in each. Group I (control) albino rat fed commercial feed with corn oil. Group II albino rats were given 50mg/kg/day di-n butyl phthalate with corn oil for 2 week. The study revealed that haemaglobin gm%, RBC and lymphocytes were decreased, 14.6% to 7.8%, 6.17-4.19millions/cmm and 78 to 44% respectively. However, number of neutrophils were increased .A significant decrease in cholesterol level (121- 51 mg/dl), protein (10 to 4.6 gm/dl) and glucose was observed in di-n-butyl phthalate exposed rats.

Keywords: Cholesterol, DBP, lymphocyte and neutrophil

Introduction

Di-n-butyl phthalate (DBP), a chemical compound used in variety of product to impart flexibility to product, contain nitrocellulose, polyvinyl acetate and polyvinyl chloride such as food wraps and blood bags (Brandt, 1985). It is also used in cosmetics as solvent, lubricant for aerosol, nail polish, printing ink, adhesive, shampoos, sunscreen, deodorant, hair spray, insect repellent, plastic tubing, and toys and in coating of some released medicine. Blount *et al.* (2000) currently estimated DBP from 0.84 μg to 113μg /kg/day on human exposure as determined from urine sample, highly exposed to phthalate. Most of the phthalate enter the environment through smoke stack emission and vaporization from plastic product. In atmosphere, it is present in both phase vapour and particulate. In modern living environment, human and animal are constantly exposed to phthalate through numerous pathways including food, ambient air, indoor air, and drinking water and through use of selected medical devices. The present study is under taken to observe the effect of phthalate on blood of experimental animal, albino rats.

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Material and Methods

Six infection free albino rats (110$\pm$15 gm) were selected for present investigation. At laboratory condition, they were maintained at 37°c temperature and relative humidity of 60-80. The rats were divided in two groups three in each. Group I (control) albino rats were fed on commercial feed with corn oil. Group II albino rats were treated with 50-mg/kg/day di-n-butyl phthalate for 2 week. Blood was collected in to EDTA tube and plain tube from descending vena cava after ether anesthesia. Hematological and biochemical values are the mean values of individual rat (treated/control). Parameters were subjected to student t test for significance at (.05 P) level.

Results and Discussion

The administration of di-n-butyl phthalate brings about significant changes in hematological and biochemical parameters. The effect of 50mg/kg/day dose of di-n-butyl phthalate on hematology through out experimental period showed a significant reduction ($P < 0.05$) in hemoglobin gm% and in RBC count as compared to control group (14.6 to 7.8gm/dl and 6.17 to 4.19 million/cumm) respectively. The decrease might have occurred due to depletion of circulating iron from hemoglobin

Table 1: Changes in hematology of male rats exposed to Di-n-butyl phthalate

Hae Parameter	Control	50 mg/kg/day DBP
Hemoglobin (gm/dl)	14.6±1.5	7.8±1.30*
RBC count (millions/cmm)	6.17±1.37	4.19±0.51*
WBC count (thousand /cmm)	7.08±0.08	4.20±0.23*
Differential leukocyte count Average %		
Neutrophil	14 ±1.58	40±1.58*
Lymphocyte	78 ± 2.54	44± 3.16*
Eosinophils	2.00±0.71	1.60±0.55
Monocytes	1.8±0.84	1.2±0.84
Basophils	2.60±1.14	2.20±1.30

Data are the mean of five replicates ± SD; * $P < 0.05$ (Significant)

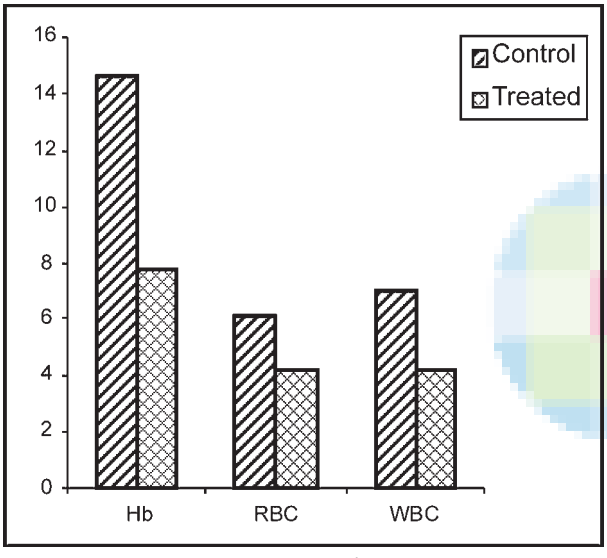


Fig.1: Comparative study of Hb%, RBC & WBC of control versus treated albino rats.

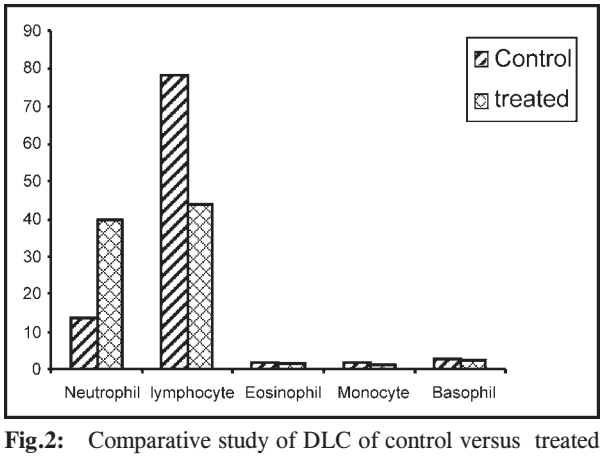


Fig.2: Comparative study of DLC of control versus treated albino rats.

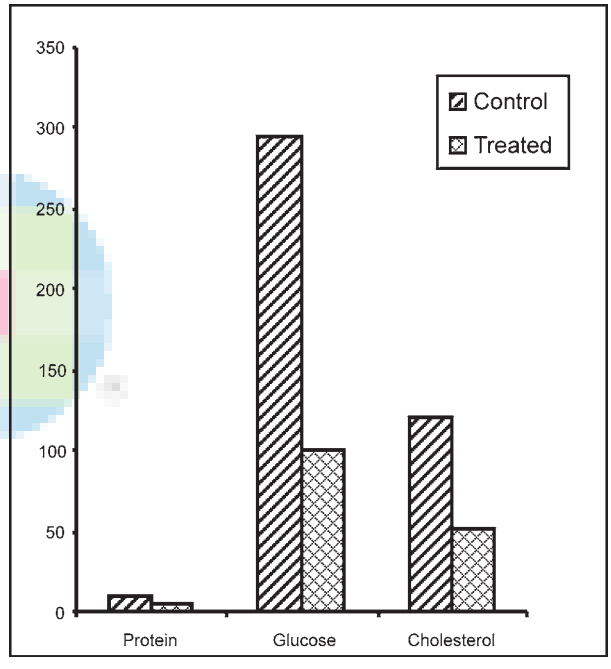


Fig.3: Compartive study of Protein , glucose & cholesterol of control versus treated albino rats

and a decrease in GSH reductase activity and Heinz body formation in red blood cells as reported by Fukuoka *et al*. (1994, 1996). The fall in hemoglobin concentration, that is related to fall in erythrocyte count, leads towards anemia in rats. The treated albino rats represent statistically significant ($P < 0.05$) rise in neutrophils (14 to 40%), but decrease in lymphocyte count ($P < 0.05$). Present study confirms the results of Short *et al*. (1987). The decrease in lymphocyte count implies reduction in

Table 2: Changes in biochemical parameters of male rats orally treated with DBP

Biochemical parameters	Control	50mg/kg/day DBP
Serum protein (gm/dl)	10 ±1.58	4.6±1.14*
Serum glucose (mg/dl)	293.6±7.92	101±5.7*
Serum cholesterol (mg/dl)	121±2.38	51±1.58*

Data are the mean of five replicates ± SD; * $P<0.05$ (significant)

the ability of the body to respond to infection, whereas rise in neutrophils adducted the ability of the neutrophil to phagocyte. It may be concluded that phthalate suppress the immunity of rats. No significant change ($P>0.05$) in basophil, eosinophil and monocyte percentage is observed as compared to control group (Results have been summarized in table-1 and illustrated with the help of histogram Fig.1 and 2).

In the DBP treated group (Table 2 and Fig. 3), significant decrease in cholesterol, protein and glucose level was ($P<0.05$) observed. Reduction of cholesterol (121 to 51mg/dl) indicates that di-n-butyl phthalate affect cholesterol metabolism of albino rats. Similar observations were reported by Bell (1982). However, according to Thompson *et al.* (2004) di-n-butyl phthalate diminishes protein expression required for cholesterol transport. Phthalate cause hypocholesterolemia in rat was cited by Marsman (1995). The decrease in the protein level (10 to 4.6gm/dl) in male albino rats are in conformity of Frode *et al.* (1982). Hypoglycemic action (glucose level 293.6 to 101mg/dl) of DBP, may be due to liver enlargement. Similar observations were reported by Seth (1982). Phthalate induced inhibition of both glycogenesis and glycogenolysis in rats and decrease activity of glucose-6-phosphate dehydrogenase is reported by Mushtaq *et al.* (1980).

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