

## CHROMOSOMAL DAMAGE AND HAIR DYE

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### Summary

In the present study twelve albino rats were taken, 4 animals were kept as controls and on 8 rats hair dye was applied daily on the head and rest of the body. After 2 months chromosomal study was done from bone marrow by the direct method. Chromosomal damage was noted in the hair-dyed animals.

There are large numbers of people who are exposed voluntarily or occupationally to hair dye. The main constituents of hair dye such as diamino-substituted benzenes, toluenes, and anisoles are mutagenic and cause chromosomal damage<sup>1</sup>. These substances readily penetrate the skin and are excreted in the urine<sup>1,2,3</sup>. Chromosomal study in hair-dye users which reported an increased chromosomal damage<sup>4</sup> has been variously commented upon by other workers<sup>5,6</sup>. There is no conclusive evidence in the literature about the effect of hair-dye on chromosomes. Rats being mammals, are good experimental models to study the influence of hair dye on the chromosome and the results of the study may be helpful in studying the effect on humans. Hence the present work was done.

### Material & Method :

The present study was done on 12 male rats. Four rats were kept as controls and on eight rats hair dye was applied daily on head and whole of the

body for a period of 2 months. Animals were killed three hours after an intraperitoneal injection of colchicine (1 ml 0.4% solution). Femurs were dissected, the epiphyses cut off and the bone marrow removed by injecting hypotonic saline through diaphyseal cavity. Bone marrow was kept in the incubator in hypotonic saline for 30 minutes at 37°C and then in cytological fixative (Glacial Acetic acid methanol 3) for a period of  $\frac{1}{2}$  hour. Slides were made by standard air dried technique and stained with Leishmans stain. Hundred metaphases were studied from each rat.

### Results :

Breaks and gaps were the common abnormalities noted in the chromosomes (Table 1). Gaps occurred at an average of 0.5% in control animals and 3.12% in hair-dyed animals. There were no breaks in control animals but in hair-dyed animals breaks were 3.75% (Table No. 2). No other chromosomal abnormality such as dicentric chromosome, sticking of chromosomes, numerical aberrations etc. were noted. Among hair-dyed animals ring chromosome was present in one.

### Discussion :

Present study shows that there is more chromosomal damage in hair-dyed rats than in non hair-dyed rats. There

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TABLE 1

Chromosomal analysis of bone marrow cells of albino rats treated with hair dye and control.  
From each animal 100 metaphases were studied.

Animal No.	Meta-phase No.	Breaks	Gaps	Other abnormalities as Dicentric, Ring, Aberrations etc.
Control				
1.	100	0	0	Nil
2.	100	0	1	Nil
3.	100	0	0	Nil
4.	100	0	1	Nil
Dyed				
1.	100	4	6	One ring Chromosome
2.	100	3	1	Nil
3.	100	6	2	Nil
4.	100	4	3	Nil
5.	100	5	3	Nil
6.	100	3	4	Nil
7.	100	2	4	Nil
8.	100	3	2	Nil

TABLE 2

Chromosomal aberrations in bone marrow cells of albino rats treated with hair dye and in control

Group of Animals	Number of Animals	Number of cells Analysed	Aberration types	Number of Affected cells	Aber-ration %
Control	4	400	Chromatid gaps	2	0.5
			Chromatid breaks	—	0
Dyed	8	800	Chromatid gaps	25	3.12
			Chromatid breaks	30	3.75

is considerable evidence already for the mutagenecity and carcinogenecity of hair-dyes and their constituents<sup>1</sup>. One study in human hair dye users<sup>4</sup> has showed interesting results. In the males chromosomal damage was less in hair dye users (gaps 4.6%, breaks 2.3%) than in controls (gaps 7.29% breaks 4.41%). This could be due to the older age of hair dye users compared to controls. The study also showed that in females there was more chromosomal damage in hair dye users (gaps 6.87% breaks 3.06%) than in controls (gaps 5.68% breaks 1.84%). In

cultured mammalian cells also hair dye has been shown to produce chromosomal damage<sup>7,8</sup>. Our results on the study in rats confirm findings in human.

**Conclusion :**

It is to be however noted that the findings of their study cannot be applied directly to human beings since in them dye application is done at intervals and only on the head ; in contrast to the conditions is the study where the dye was applied continuously over head and body for a period of 2 months.

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