GENOTOXIC EFFECT OF DISTILLERY EFFLUENT IN MITOTIC CHROMOSOME OF MICE (MUS MUSCULUS)

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Abstract : Among 300 abnormal metaphase cells the total frequency of abnormalities 18(6.00± 1.37) 24(8.00 ± 1.56) and 32(10.66 ± 1.78) were found. It exhibits that the effect do effluent is dose dependent. C-mitosis, stickness and clumping were common among gross type, while acentric fragment, minute fragment, chromatid break and chromatid gaps were more common among individual type of abnormalities.The individual type of damage were prominent than gross type. This might be due to the formation of electrophilic radicals/ions during the metabolization of mutagens that attack the nucleophilic site of DNA leading to structural changes in chromosome. Effluent probably cause and increase formation of base analogue to act as a mutagen that induce chromosomal abnormalities.

Keywords : Mice, Effluent, Chromosome Anomalies, Bone marrow.

I. INTRODUCTION

Factories discharges large quantity of untreated effluent which contain many toxic substances. Thus posing a solemn damage to the life of plants, cattle, human beings etc. they make water unsuitable for consumption. Cytogenetic – toxicity by these pollutants is one such hazard. However, the genotoxicity of industrial effluent (Moore; T. C. et.al; 2003); (Pathak Shipra et.al; 2002) chemical (Rangaswamy and Shanthamurty, 1980) steel (Thakur and Roy, 1986) paper (Mahapatra et.al; 1986) as well as sugar (Manivannan, S et.al; 2004) distillery (Ranjit singh AJA et.al; 2002) has been investigated.

North Bihar has a large number of sugar based factories. Unprocessed effluents from these factories are discharged directly into Ponds, rivers and their tributaries and cause water pollution.

Therefore, in the present investigation an attempt was made to evaluate the cytogenetic toxicity of distillery effluent.

II. MATERAL AND METHODS

The distillery effluent was collected from main outlet of factory. The collected effluent considered as 100% concentration. By dilution with distilled ware, 1, 2 and 4% concentration of the effluents were prepared.

6 – 8 week old laboratory – bred Swiss albino mice Mus musculus (S-cdri, 2n – 40), seed colony obtained from Central Drug Research Institute, Lucknow (India) were used.

Mice were orally administered each concentration of effluent at the rate of 1ml/day (Chaurasia, 2005) for seven consecutive days. The mice of the control group were given only 1 ml distilled water per day. The animals were sacrificed immediately after completion of such treatment. The extraction of marrow and preparation of slides were made by colchicines – hypotonic – aceto – alcohol-flame drying giemsa staining technique (Preston et. al. 1987). About 300 well spread metaphase plates at the rate of 20 plates/animal from 15 animal of each group were screened randomly. Data were analyzed by statistical procedure.

III. RESULT AND DISCUSSION

Amidst 300 metaphase plates screened 14(4.66 ± 1.21), 19(6.33 ± 1.40) and 24 (8.00 ± 1.56) cells were found to be abnormal in 1, 2 and 4 concentration respectively in comparison to the control where only 10(3.33 ± 1.03) cells were abnormal. Total chromosomal abnormalities were 18(6.00 ±1.37), 24(8.00 ± 1.56) and 32(10.66 ± 1.78) in 1%, 2% and 4% concentration respectively in comparison to the control to 10(3.33 ± 1.03) (table: 1). The abnormalities were found can be put in two categories – gross and individual ones. The instignifican gross changes were the stickiness, polyploidy, hypopolidy etc (fig:3). The significant individuals were mostly breaks in the chromosome (chromatid break, chromatid gap.) Acentric fragment and minute fragment (Fig: 3) were also observed that might be cue to breaks and deletion of certain part of chromosome (telomeric or interstitial part). A quantitative estimation revealed that the abnormalities increased with the increase of the doses. Thus, the effect was dose dependent (fig: 2). The individual type of damages were more prominent than the gross type (Fig: 1). While Chaurasia and Sinha 1988, 1990, Chaurasia et.al; (2005) were studying or genotoxicity induced by fertilizer and silk dyeing wastes, Kumar an Sinha (1989) on doses 0 dependent genotoxic effect of synthetic pesticides. They observed that the individual type of damages were more frequent than the gross type. Bose and Sinha (1994), Dharmshila and Sinha 1994 and Awasthy et. al. (2000) could find that the bio-mutagens induced more gross type of abnormalities than individual types.

Table : 1

Frequency of Chromosomal abnormalities (%± S.E) in distillery effluent treated bone marrow cells in Mice.

Experiment	No of Metaphase analyzed	abnormal Metaphase	individual abnormalities	gross abnormalities	total abnormalities
		no % ± S. E	no % ± S.E	no% ± S.E	no % ± S.E
control	300	10 3.33 ± 1.03	6 2.00 ± 0.80	4 1.33 ± 0.66	10 3.33 ± 1.03
1%	300	14 4.66 ± 1.21	12 4.00 ± 1.13	6 2.00± 0.80	18 6.00± 1.37
2%	300	19 6.33± 1.40	16 5.33± 1.29*	8 2.00± 0.92	24 8.00±1.56*
4%	300	24 8.00±1.56	23 7.66±1.53	9 3.00± 0.98	32 0.66±1.78*

*Indicate significant difference at 5% Level with corresponding Values in the Control.

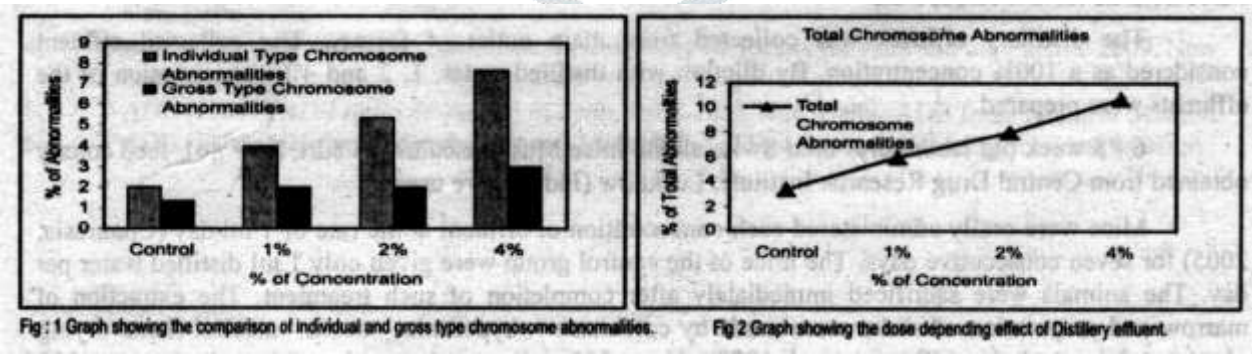

Fig : 1 Graph showing the comparison of individual and gross type chromosome abnormalities. Fig 2 Graph showing the dose depending effect of Distillery effluent.

The induction of gross and individual type of abnormalities revealed that these effluent might be produced the damage at two different levels first interfere with the functioning or assemblage at the spindle apparatus leading to gross types of changes and secondary by disturbing the chromosomal morphology. During the metabolism of effluent elctreophilic ion and reactive radicals might be interacting with the nucleophileic sites in DNA and leading to break and other related damage in latter (Klop man et. al:1985) Effluent exhibited that individual type of damage were more frequent than the gross type on various doses by virtue of its synthetic nature.

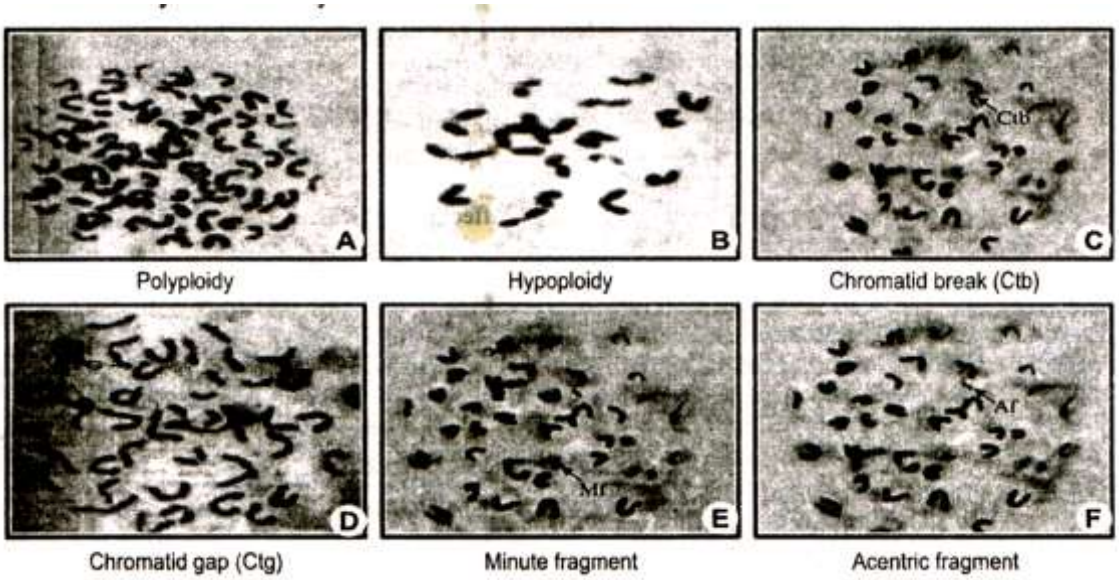

Fig: 3 Abnormal Metaphase showing Chromosomal abnormalities

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