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RESEARCH ARTICLE OPEN ACCESS

Genotoxicity Caused by Sodium Fluoride in Bone Marrow Cells of Mice

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Abstract

Background: Fluoride is one of the potent toxicants to which humans are exposed. It induces various anomalies such as skeletal fluorosis, osteoporosis, cancer, dental problems, psychological problems and arthritic pains. Little literatures are available about the genotoxicity of fluoride in bone marrow cells of mice. Therefore, the present has been undertaken to study the genotoxicity of fluoride in mice. ***Methods:*** Laboratory inbred albino Swiss Mice (*Mus musculus*) of average body weight 25 g were fed orally with 2 ppm NaF by soaking with bread for 30 consecutive days. 300 well spread metaphase plates were screened randomly. Number of abnormal cells and chromosomal abnormalities were calculated and interpreted based on statistic. ***Result:*** Sodium fluoride (2 ppm/animal/day) when administered orally to Albino Swiss mice (*Mus musculus*) for 30 days increased the frequency of abnormality by 5.66% compared to 1.66% of control in mitotic chromosome in bone marrow cells. The increase in frequency of chromosome anomaly was mainly due to a significant increase in both gross and individual type. Hypoploidy and chromatid breaks are found to be more frequent. **Conclusion:** Fluoride pollution is a global problem and induce genotoxic effects on animals, especially those who drink water containing non-permissible concentrations of fluoride. A safety measure must be followed either by supplying the processed water without the fluoride concentration to human population or by supplementing any antioxidants to nullify the harmful effect of fluoride.

Keywords: Sodium Fluoride, Chromosome, Bone Marrow, Albino Swiss mice.

INTRODUCTION

Fluoride is one of the potent toxicants to which humans are exposed. It ranges from 0.7 to 4.5 ppm and induces various anomalies such as skeletal fluorosis, osteoporosis, cancer, dental problems, psychological problems and arthritic pains. It also causes the effect on renal, gastro-intestinal, immune system and reproduction [1]. Fluoride is also essential element needed for normal development of both animals and human beings [2].

In addition to ingesting fluoride in drinking water, people now received fluoride from a large no of other source such as toothpastes, mouth rinses, soft-drinks, tea, processed foods and vegetables. Fluoride is also added when fluoridated water is used during drinking [3].

Low level of fluoride in food rendered mice infertile high fluoride diet improved their fertility [4,5]. According to *Tao and Suttie* fluoride did not play any essential role in reproduction. Recent investigation showed that fluoride interferes with the structural and functional integrity of testis, inter milieu of epididymis and also affect the metabolism of spermatozoa of mice and rabbits with reduced fertility. It also interferes with phagocytosis and induces the release of super oxide free radicals which damages the body leading to further ageing process [6].

Fluoride can react with divalent cations in the cell to affect enzyme activities or chromosomal metabolism or maintenance. It might react directly with DNA as a part of a complex or it can disrupt other metabolism. Little literatures are available about the genotoxicity of fluoride in bone marrow cells of mice [7]. Therefore, the present has been undertaken to study the genotoxicity of fluoride in mice.

MATERIALS AND METHODS:

Laboratory inbred albino Swiss Mice (*Mus musculus*) of average body weight 25 g were fed orally with 2 ppm NaF by soaking with bread for 30 consecutive days. Then the animals were sacrificed and slides were prepared by colchicines-hypotonic acetomethanol-flame drying giemsa staining technique [8,9]. 300 well spread metaphase plates were screened randomly. Number of abnormal cells and chromosomal abnormalities were calculated and interpreted on the basis of statistic [10,11].

RESULTS AND DISCUSSION:

The total frequency of abnormal metaphase in the NaF treated group was 5.66% which is significantly higher than that of control 1.66%. Both gross and structural types of changes were found in both groups.

In control group the frequency of total abnormalities were 14(4.66±1.21) of which structural abnormalities 9(3.0±0.97) and gross type 5 (1.66±0.54) respectively (Table-01).

Treatment with 2 ppm concentration of sodium fluoride induce a significant increase in total abnormalities by 93 (30.99±7.13) of which structural types of abnormalities were 76 (25.33±6.30) and gross type 17(5.66±1.77) respectively (Table-01). Among the structural type abnormalities, acentric fragments, minute fragment, chromatid breaks and chromatid gaps. The incidence of gross type abnormalities were polyploidy, hypoploidy, stickiness and clumping.

The increase in the chromosomes abnormalities were due to the increase in both abnormalities of individual or structural and gross type. Structural types of abnormalities were significant.

Table 1: Frequency of chromosomal abnormalities of sodium fluoride treated bone-marrow cells in mice after 30 days exposure (n=300 metaphase).

Experimental Variant	Structural Abnormalities		Gross Abnormalities		Grand Total	
	No.	% ± S.E	No.	% ± S.E	No.	% ± S.E
Control	9	3 ± 0.97	5	1.66 ± 0.54	14	4.66 ± 1.21
NaF (2 ppm)	76	25.33 ± 6.30	17	5.66 ± 1.77	93	30.99 ± 7.13*

**indicate significant differences at 5% level*

Pollutants may damage at two levels: cell and chromosome level, leading to mitotic poisoning and or chromosome structure changes respectively. Biomutagens (Aflatoxin, orchatoxin, plant extract etc.) induce mitotic poisoning [12], while chemical mutagens induce chromosomal abnormalities. Several workers were also reported the same pattern of action on the cell by various biopollutants [12]. The present finding is similar to the observation of [7]. Thus, sodium fluoride induced genotoxicity in bone marrow cell of mice.

CONCLUSION:

Fluoride pollution is a global problem and induce genotoxic effects on animals, especially those who drink water containing non-permissible concentrations of fluoride. A safety measure must be followed either by supplying the processed water without the fluoride concentration to human population or by supplementing any antioxidants to nullify the harmful effect of fluoride.

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Abbreviation used: None

REFERENCES:

1. Bhunya SP and Pati PC. Genotoxic effect of an environmental pollutants. Sodium fluoride in mammalian in vivo test system. Caryologia. 1987;40:79-87.
2. Dhar V and Bhatnagar M. Physiology and toxicity of fluoride. Indian J Dent Res. 2009; 20(3):350.
3. Chinoy NJ. and Narayana MV. Study on fluorosis in Mehsana district of North Gujarat. Proceeding of the Zoological Society, 1992;45(2):157-61.
4. Messer HH, Armstrong WD, Singer L. Influence of fluoride intake on reproduction in mice. J Nutr. 1973; 103 (9): 1319-1326.
5. Tao and Suttie. Evidence for a lack of an effect dietary fluoride level on reproduction in mice. J Nutr. 1976; 106 (8): 1115-22.
6. Yiamouyiannis J, Gerald J. The ageing factor, fluoride and cancer. Fluoride Health Action Press, 1993.
7. Kumari P and Chaurasia OP. Genotoxic effect of fluoride bone marrow cells of in mice (Mus musculus), Sciencia. 2015; 3(6): 28-30.
8. Chaurasia OP and Sinha SP. Effects of urea on mitotic chromosome of mice and onion. Cytologia. 1987; 52: 877-882.
9. Singh N. and Kumari D. Genotoxicity of water pollutant and it amelioration. The Ecoscan, 2012; 1:209-212.
10. Chaurasia OP, Kumar A, Kumari M. Genotoxic effect of silk dyeing wastes in bone marrow cells of mice, Mus musculus, Cytologia. 2005; 70 (4): 381-385.
11. Chaurasia OP, Kumari, Chanda; Ankita and Sangita. Genotoxic effect of ground water salts rich in fluoride, Cytologia. 2007; 72(2): 141-144.
12. Awasthy KS, Chaurasia OP, Sinha SP. Cytogenetic toxicity of leaf extracts of Putranjiva roxburghii a medicinal plant. J Toxicological Sci. 2000;25(3):177-180.

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