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STUDY OF MICRONUCLI FREQUENCY IN DIFFERENT LEAD EXPOSED POPULATION

Ajanta Halder *, Madhusnata De

Department of Genetics, Ma Sarada College of Nursing, Vivekananda Institute of Medical Sciences, Ramakrishna Mission Seva Pratishthan, 99, Sarat Bose Road, Kolkata - 700 026, India.

Fax No: 91 - 33 - 2475 - 4351. Phone No: 91 – 33 - 2475 - 3636 / 37 / 38 /39 / 30, 91 - 33 - 2475 - 0680 / 81 / 31

Email address: ajantahaldar@yahoo.com

**Corresponding author*

ABSTRACT

Lead and lead compounds play a significant role in modern industry; a wide variety of population is at risk of occupational exposure and lead is suspected to be a human carcinogen. Chronic exposure to sub toxic levels of mutagenic metals is a cause of concern as such exposure has been seen to result in genetic modifications. Analysis of micronucleus (MN) in exfoliated buccal cells is a sensitive method for monitoring genetic damage in human population. In our study, we used four different occupational groups, Group 1; Directly lead exposed garage workers (30 cases), Group 2; Directly exposed lead smelter factory workers (30 cases), Group 3; Indirectly lead exposed hospital staff (30 cases), Group 4;Control group (30 cases).

We analysed MN frequencies in exfoliated buccal cells and compared the directly and indirectly exposed groups with control groups.

The mean (±SD) MN (%) frequencies in exfoliated buccal cells from group 1 and 2 were 0.12±0.05 and 0.15±0.05 respectively and the mean (±SD) MN (%) frequencies in exfoliated buccal cells from group 3 and 4 were 0.06±0.04 and 0.05±0.04 respectively.

INTRODUCTION

The vehicular traffic emission has been the main source of the high lead burden in the ambient air of the major cities of the world, especially those with high traffic density and vehicles without adequate emission control devices. *UNICEF (2000)* declared that automobiles that burnt leaded gasoline were a major source of lead in air, dust and soil. *Parekh et al. (2002)* observed that the element entered the body either through direct inhalation of lead bearing aerosols from vehicular traffic and / or ingestion of lead deposited on soil, food, crops and potable water. To study whether there are any effects of occupational lead exposure on DNA damage we used micronuclei from buccal smear of 90 workers in Kolkata, India.

MATERIAL AND METHODS

Buccal smears were obtained three different occupational groups that were potentially exposed to lead. We have used 30 age and sex matched control who had no history of exposure.

MICRONUCLEI IN EXFOLIATED BUCCAL CELLS

Subjects were asked to rinse their mouths with water and a premoistened wooden spatula was used to samples cells from the buccal mucosa. The spatula was applied to a precleaned microscope slide. Smears were air dried and fixed in 80% methanol. Slides were stained by Giemsa. Criteria of scoring were described by *Sarto et al. (1990)* and *Tolbert et al. (1992)*. One thousand cells were scored blindly by the same person.

RESULT AND DISCUSSION

As indicated in table 1 the percentage of micronuclei is high in case of directly lead exposed workers i.e. garage workers and lead smelter factory workers, whereas in case of hospital staff and control groups the percentage is more or less same.

In our study, three different groups occupationally exposed to lead and controls that

matched to this populations were monitored for MN in exfoliated buccal cells. The induction in vivo and in vitro, of micronucleated cells by carcinogens and mutagens is a sign of the genotoxic effects of such substances *(Mandard et al. 1987)*. The MN assay in exfoliated cells is an innovative genotoxiciy technique which holds promise for the study of epithelial carcinogens *(Tolbert et al. 1992)*. In our study we found a significant increase in micronuclei percentage from control (Group 4) to directly exposed population (Group 1 and Group 2) but the difference between control and hospital staff that is indirectly exposed population is negligible. The difference between control and directly exposed population was statistically significant ($p<0.05$).

Most human cancers are epithelial in origin, about 92% being derived from the external and internal epithelium, ie the skin, the bronchial epithelium and epithelia lining the alimentary canal. Effective technique have not yet been developed for making direct chromosome preparations from epithelial tissues. The increase in micronuclei (MN) frequency may be related to occupational exposure to silica. *Bolognesi et al. (1997)* also found higher frequency of MN in traffic police officer exposed to lead. *Sarto et al. 1990* applied the MN assay to exfoliated cells of buccal and nasal cavities to monitor the genotoxic risk in a group of workers exposed to chronic acid and found that nasal mucosal was not altered in chromium platers. *Stich and Rosin 1983* showed the synergistic effect of smoking and alcohol consumption with the MN test on buccal cells. They found an elevated frequency of micronucleated buccal mucosal cells. *Kayal et al. 1993* carried out among oral submucous fibrosis patients who had the habit of chewing either mara or areca nut. They found a significant increase in MN frequency. *Casartelli et al. 2000* observed micronucleus frequencies in exfoliated buccal cells in normal mucosa, precancerous lesions and squamous cell carcinoma and observed miconucleus frequencies were increased in precancerous lesions as compared to normal mucosa. *Nersesian et al 1993* analysed micronuclei in the oral mucosal cells of cancer patients for assessing the clastogenic effect of chemical preparations.He showed that frequency of micronuclei in the cells of patients before therapy and control were at the same level whereas one day after chemotherapy the frequency of micronuclei was elevated 3.2 times.

On the considerations about the risk associated to exhaust exposure, it should be indicated that exhaust exposed to groups are not only exposed to the variable mixture of hydrocarbons present in the exhaust fumes, but also to the emissions produced by internal combustion of the engines that may exert genotoxic effects. Such a complex range of exposure can be responsible for the variation in genotoxicity levels among different bio monitoring studies on people exposed to exhaust fumes.

This study, as well as several others have identified the potential dangers and the possible clastogenic effect of exposure to lead. Therefore, it is recommended that improved effective protective measurements should be considered to avoid the health hazards.

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TABLE 1. Micronuclei Study

Year of exposure	No of cases	Micronuclei Percentage (mean ± SD)
Control	30	0.05 ± 0.04
Garage Workers (Direct Exposure)	30	0.12 ± 0.05
Lead Smelter Workers (Direct Exposure)	30	0.15 ± 0.05
Hospital Staff (Indirect Exposure)	30	0.06 ± 0.04

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