Preface

In any industry, the workers and the people living nearby are exposed to chemicals and gases, which are being used or discharged as effluents. Some, if not most of these, are capable of causing mutations or of causing changes in the genes of exposed populations. Such changes in the genes of an exposed person may lead to sterility and cancer and to inherited defects in the next generation. While there are many available tests for identifying overt toxic effects on human beings like allergy, irritation, infections etc., very few tests are available for measuring the genotoxic effects. This is because the knowledge about genotoxic effects is relatively vague and also because man has a rather longer life span than experimental animals and the alterations found can not be directly related to the cause.

The hydrogen bombs exploded at Hiroshima and Nagasaki showed up the long term effects of radiation on human beings. The interest in effects of exposure to work place chemicals started after the industrial accidents at Sevesco (Italy) and Bhopal (India). These accidents focussed the risks to the human system after exposure to chemicals which may cause mutations (mutagens). The term used is now "work place mutagens". This involves a complex mixture of chemicals and gases, to which a person is exposed for shorter or longer periods. In fact, chronic exposure for long periods to low subacute doses is more genotoxic than short acute exposure to a single relatively high dose.

Experiments have shown that both workers, who directly handle the materials in an industry, and the office and supervisory staff, who do not come in direct contact, show evidence of possible genotoxicity after a period. Ultimately, such changes often led to alterations which may be expressed after a long time as sterility, foetal loss or abortions and even cancer, especially of the blood, bladder and lung.

Since the means used for testing genotoxic effects are easy, non – invasive and relatively cheap, the work place environment can be easily monitored by testing the ambient air and effluents as well as the blood and urine of all the personnel employed. It also helps to find out the persons at risk, that is, those who are more susceptible to the environmental agents.

These tests, carried out once and twice a year, will help to keep down conditions, which might lead to a large number of diseases and thus decrease health insurance demands. The environment can be controlled by the minimum measures to keep within industrial pollution laws and reduce litigation, if the management follows the suggestions of the genotoxic monitoring unit.

The frequency of chromosomal changes induced or the amount of excretion of mutagens, both used frequently to monitor genotoxicity, can be reduced and finally eliminated by improving the work place environment and diet. A considerable amount of improvement can be achieved by advice and counseling about the correct diet, exposure and work place atmosphere. It is cost-beneficial since these suggestions are easy to implement and cheap in the long term.

A large number of tests have been standardized for finding out the genotoxic effects of environmental chemicals and the lower threshold or the safe levels of exposure. Some of them have been listed during the International Congress of Environmental Mutagens (1989) and by the Environmental Protection Agency. The organisms on which the chemicals have been tested include, amongst others, bacteria (Ames test), yeast (Sacchatromyces), various plants (Allium sp., Tradescantia, Vicia, maize) and different experimental animals (fish, laboratory bred mice, rats, Chinese hamster). The endpoints screened for are mutagenic, teratogenic and carcinogenic effects. The human system is represented by human cells in culture and tissues. The data are statistically relevant and accepted all over the world in different laboratories. Computer software is available for data entry and comparison with known reports.

Ambient air and effluents from the work place, and blood, serum and urine from workers exposed can be tested by the methods given above for genotoxic effects. Usually at least three test system are used in screening the genotoxicity of any one material. If any one test gives statistically positive results when compared with a negative control, it is repeated. More than two positive results are graded against genotoxicity standards again statistically. The results show whether the exposure has affected the person(s)

mildly, seriously or to an alarmingly high level. These tests are carried out routinely in all large and medium scale industries to identify and reduce safety hazards. Genotoxic effects have been reported by many work place chemicals, like effluents and chemicals from industries manufacturing shoe, tyre, paints, varnish, steel, pottery, ceramics, dyes, pesticides, detergents and in tin plating, mining, road repairs etc. The incidence of cancer, sterility, foetal loss and immunodeficiency are only a few conditions, which are considerably increased due to genotoxic hazards.

Kolkata
2004

Geeta Talukder
Madhusnata De