

EXECUTIVE SUMMARY
UGC-MAJOR RESEARCH PROJECT

43-80/2014(SR)

**The study of xenobiotic metabolizing gene polymorphisms and their
association with cytogenetic biomarkers in pesticides exposed
workers**

Submitted by
Dr. Anil Kumar
Assistant Professor
Centre for Medical Biotechnology
Maharshi Dayanand University,
Rohtak-124001

Executive Summary of the Major Research Project Entitled “The study of xenobiotic metabolizing gene polymorphisms and their association with cytogenetic biomarkers in pesticides exposed workers” sanctioned to Dr. Anil Kumar, Assistant Professor, Centre for Medical Biotechnology, MDU, Rohtak by University Grant Commission, New Delhi, (F.No-43-80/2014(SR))

Summary

In our study, we have taken 125 Pesticides exposed workers and 105 unexposed subjects. The participants were recruited in study on the basis of well-defined inclusion and exclusion criteria. We studied the demographic characteristics viz. sex, age, consumption habits (smoking, alcohol intake and tobacco chewing), and exposure duration of participants using an especially designed questionnaire. We found statistically non-significant differences in distribution of age, sex and consumption habits among control and exposed subjects ($p > 0.05$). The exposed workers had a mean age (years) of 37.62 ± 9.94 while mean age (years) of control was 35.86 ± 8.25 . The majority of participants were non-smokers, non-alcoholics and non-tobacco chewers.

The blood samples were collected from all the participants using standard operating procedure and brought to laboratory and further processed for cytogenetic examination and to determine allelic variations in xenobiotic metabolizing genes. Based on the results of the present study, following conclusions were drawn -

- The pesticides exposed workers were found to have significantly ($p < 0.05$) increased frequency of all the cytogenetic biomarkers (CBMN: 4.27 ± 1.97 ; BMN: 5.24 ± 1.96 ; SCE: 5.11 ± 1.71 ; CA-chromatid type: 1.10 ± 0.89 and chromosomal type: 1.35 ± 0.79), when compared to controls (CBMN: 3.6 ± 2.37 ; BMN: 4.13 ± 1.84 ; SCE: 4.19 ± 1.85 ; CA-chromatid type: 1.03 ± 0.74 and chromosomal type: 1.35 ± 1.02).
- Cytogenetic damage among both groups showed liner relationship with age. The age group (47-60 years) found to be more affected.

- The DNA damage caused by occupational pesticide exposure also showed linear relationship with exposure duration. The participants having more than 20-40 years of working exposure showed significantly higher cytogenetic damage.
- The consumption habits (smoking, tobacco chewing and alcohol intake) were found to show profound effect on cytogenetic damage among all the participants.
- Our findings suggest that polymorphism in metabolizing genes plays vital role in inter-individual susceptibility to various occupational and environmental exposure. Significant association between cytogenetic damage and allelic variation in GSTM1, GSTT1, CYP1A1 and CYP2E1 was observed.

Significance of the work

Biomonitoring of pesticide-exposed workers will contribute to a more effective risk management and prevention of pesticide poisoning and adverse health effects. The ability to detect different levels of health risk within the occupationally exposed population and greater understanding of etiologic mechanisms are the primary benefits of incorporating genetics into the existing occupational health research framework. The insights gained by employing this framework will help in the development of new disease prevention strategies. The use of this information in risk assessments may also be a viable area of development.