

CYTOGENETIC BIOMONITORING ON A COHORT OF PETROLEUM REFINERY WORKERS

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Occupational exposure represents a big concern for modern society because a huge amount of people are employed in industrial factories and despite the use of personal protective devices, they are continually exposed to potentially toxic compounds. In particular, workers of petroleum plants are exposed to a wide range of toxic compounds (benzene, polycyclic aromatic hydrocarbons, heavy metals, etc.) a number of which have been classified as carcinogen for human beings by the International Agency for Research on Cancer (IARC).

Recent data reported no increased mortality from digestive (stomach, large intestine, liver, or pancreas), lung, bladder, kidney, or brain cancer for petroleum refinery workers, but a small increase in skin cancer mortality was found. Significant increases in melanoma mortality were found in some small groups of refinery workers in the United Kingdom and upstream operation workers in Canada (1). Despite many epidemiological data are present in literature, only very few cytogenetic monitoring studies on petroleum workers are still available. Chromosomal aberrations (CA) represent useful biomarkers of genotoxicity, which give information on the persistent damage at the chromatid or chromosome level, identifying irreversible DNA damage. Moreover, several studies demonstrated that CA are involved in tumorigenic processes and that CA frequencies could be predictive of a potential cancer risk (2).

Out of more 500 petroleum refinery workers enrolled in the study, we analyzed chromosomal aberrations on human peripheral blood lymphocytes (PBL) from 78 male subjects (47 non-smokers and 31 smokers) and a total of 51 male control subjects (34 non-smokers and 17 smokers) selected by using very strict selection criteria.

The comparison of total chromosomal aberrations (CA tot%) in PBL between exposed and control populations pointed out a significant increase ($p < 0.001$) in the exposed group (4.0 ± 2.5) compared to controls (1.6 ± 1.3). The chromatid-type (CtA%) and chromosome (CsA%) aberrations were also significantly higher in the exposed group in comparison to the control one (2.9 ± 2.2 vs 0.9 ± 0.7 ; $p < 0.001$) and (1.1 ± 1 vs 0.7 ± 1 ; $p < 0.05$) respectively. As far as the effect of smoking habit and working age on the level of chromosome damage, we didn't observe any significant associations.

In conclusion, our results are indicative of a potential genotoxic risk related to the complex occupational exposure in petroleum refineries, despite the measures adopted in the plants, and corroborate the need to increase safety measures.

References

- (1) Wong, O., *et al.* (2000) A critical review of cancer epidemiology in the petroleum industry, with a meta-analysis of a combined database of more than 350,000 workers. *Regul Toxicol Pharmacol*, 32, 78-98.
- (2) Norppa, H., *et al.* (2006) Chromosomal aberrations and SCEs as biomarkers of cancer risk. *Mutat Res*, 600, 37-45.