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Genotoxicity in peripheral blood leukocytes and reticulocytes of e-waste management workers

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The European Commission recently adopted a new Circular Economy Action Plan, which recognizes the critical role of material circulation in achieving sustainable development. The waste management sector will play a pivotal role in this, and an increase in the number of workers involved in waste recycling is expected. However, a recent multi-centric study[1] conducted as part of the European Human Biomonitoring Initiative (HBM4EU) highlights potential occupational health risks associated with e-waste management.

This study reports the exposure of e-waste workers from six European countries to metals and the genotoxic effects from exposure to a wide array of toxic chemicals in the occupational environment.

The results showed that e-waste workers are exposed to higher levels of hazardous metals such as lead, cadmium, mercury, and chromium than controls. Significantly higher levels were detected in the post-shift urine and blood samples of different subgroups of e-waste workers. Especially the level of lead was elevated in urine and blood samples among all worker groups, and the highest values were detected in battery recycling workers.

Genotoxic effects were assessed by the micronucleus assay in peripheral blood lymphocytes (MNPBL) and reticulocytes (MNRET). MNPBL were analyzed in 95 workers and 50 controls, and MNRET in 82 workers and 41 controls. While there were no statistically significant

differences between all workers and controls, the subgroup of battery recycling workers showed significantly higher frequency of MNPBL than controls or other exposed subgroups such as workers handling white goods, metals and plastics or miscellaneous e-waste. The highest MNPBL and MNRET frequencies were observed in workers handling brown goods, but the difference to controls, or to the other worker groups, was not statistically significant.

Post-shift urinary levels of studied metals did not show positive correlation with the micronucleus frequencies, which might be partially explained by the heterogeneity of activities considered and related exposure levels found. In addition to metals, the study also measured exposure to flame retardants, phthalates, and polychlorinated biphenyls and, thereby, correlations between exposure to those compounds and effect biomarkers will be further explored.

Overall, the study highlights the need to raise awareness of potential hazards and improve risk management measures in the e-waste management sector. The micronucleus results provide valuable new information on early biological effects from occupational exposures during e-waste management that also contribute to identifying worker groups at higher risk of adverse health effects.

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References

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