

Longitudinal mercury monitoring in two different lamp recycling units of a large Belgian waste company

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Introduction

Mercury (Hg) and its organic compounds are mainly absorbed by inhalation and excreted by the kidneys. According to the Belgian Welfare Law, chemicals like Hg that can cause intoxications, need to be monitored at least twice a year. Hg in urine is an accurate indicator to monitor exposure. Exposure can be assumed while recycling discarded Hg-containing lamps, such as fluorescent tubes.

Research question: did renewal of the lamp recycling machinery lead to lower Hg concentration in urine samples among employees in a Belgian waste company?

Population and Methods

From January 2010 to September 30, 2018, all employees (all men) of the recycling line of fluorescent lamp tubes underwent a weekly urine sample following a strict procedure.

A retrospective longitudinal survey during the above mentioned eight year period was carried out. Weekly biological and environmental monitoring including stationary sampling were used. In 2016, an additional new lamp recycling machine was installed. Besides Hg, other variables were included such as the type of recycling machinery (old vs. new), and the employees' affiliation (internal or external).

Results

Mean Hg in 2018 was 4.84 µg/g creatinine (SD 2.74), beneath the OSHA limit of non-exposure (<5.00 µg/g creatinine). A general declining trend of mean Hg exposure was observed between 2012 and 2018. Comparing Hg exposure between employees working at the new vs. old machine provided mixed evidence. In 2016, mean Hg was significant ($p < .05$) lower among workers working at the new machine (6.70 µg/g creatinine [SD 3.68] vs. 7.28 µg/g creatinine [SD 4.44]). In 2017 and 2018, mean Hg was higher at the new machine, but not significantly. In the period 2016-2018, a significant lower mean Hg exposure was found among internal affiliated employees compared to externals (4.27 µg/g creatinine [SD 2.58] vs. 6.14 µg/g creatinine [SD 3.16]). Environmental stationary sampling revealed presence of Hg due to fluorescent tube recycling. However, no patterns were found between biological and environmental monitoring.

Conclusion

Long term Hg follow-up inspired engineering of new machinery towards low exposure. In 2016, mean Hg was significant lower among workers working at the new machine, while in 2017 and 2018, mean Hg was higher at the new machine, but not significantly. A general declining trend of mean Hg exposure was observed between 2012 and 2018, with the mean Hg value in 2018 beneath the OSHA limit of non-exposure. Awareness of being monitored may also increase employees' prevention behavior.