Validation of an International Job Exposure Matrix for Extremely Low Frequency Electromagnetic Fields based on Exposure Measurements from Workers in the Netherlands

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ABSTRACT

Introduction
There remains ambiguity around the health effects associated with extremely low frequency magnetic fields (ELF-MF). Epidemiological studies have suggested an association between occupational exposure to ELF-MF and neurodegenerative disorders and the International Agency for Research on Cancer has indicated that ELF-MF is possibly carcinogenic to humans but that the evidence of carcinogenicity is limited. The low quality of the exposure assessment is among the shortcomings of previous epidemiological studies.

In light of this we are collecting ELF-MF measurements in occupational settings throughout the Netherlands that will be used to validate and refine an existing International Job Exposure Matrix (JEM) that was constructed using exposure data from seven countries not including the Netherlands. The refined Job Exposure Matrix will be applied in several ongoing epidemiological studies investigating the link between ELF-MF exposure and health effects in The Netherlands. An additional objective is to provide a tool that may be used to advise Dutch employers and employees on probability of compliance to occupational exposure limits as laid down in the revised EU Physical Agents Directive that will come into force in May 2014.

Methods
Using EMDEX II meters that measure ELF-MF levels within broadband frequency (40 – 800 Hz), more than 600 full-shift personal exposure measurements of ELF-MF will be collected from workers with various jobs and workplace settings. These are accompanied by workers' diaries indicating tasks performance during exposure measurements.

Based on his/her time-weighted average exposures (TWA) each worker is categorized as low- (<0.15 μT) medium- (0.15 μT< TWA< 0.3 μT) or high- (>0.3 μT) exposed. These categorizations are then compared with the exposure assignment based on the existing JEM.

The full exposure profile of each worker will be examined to compare peak exposure levels with the EU regulatory limits of 500- and 1000- μT that have been defined in the original and proposed update of the EU Physical Agents Directive, respectively.

Results and Conclusions

Three hundred and forty-five measurements from two hundred and forty workers have been collected to date. Preliminary data analysis suggests that there is some degree of exposure misclassification when exposure is assigned based on the International JEM. This suggests that refinement of the current JEM is warranted. It may also be expedient to add an industry-related axis to the JEM. Firm conclusions will be drawn following the completion of the exposure monitoring surveys and a more comprehensive statistical modeling of the exposure measurement data. The outcome of these analyses will be presented.