A study on the impact of frequency of overall changes on the dermal absorption of polycyclic aromatic hydrocarbons (PAH) on the coke oven worker

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ABSTRACT

Background: Coke oven workers are known to be exposed to PAH and the extent of their exposure can be measured using urinary 1-hydroxypyrene. A reduction in exposure to PAH and therefore a reduction in excretion of 1-hydroxypyrene in the urine has been demonstrated previously with improved work wear and hygiene measures.

Aims: To assess the impact of differing patterns of work wear usage on urinary 1-hydroxypyrene measurements on a population of coke-oven workers in South Wales.

Methods: An intervention study was conducted using the population of workers exposed to highest levels of PAH, i.e. battery workers on a coke oven in South Wales. Each participant changed overalls at differing frequencies thus acting as their own controls. Urine samples were collected at the beginning of the first rotation and at three rotation ends. These were analysed for 1-hydroxypyrene using a high-pressure liquid chromatography technique. A concurrent occupational hygiene study was performed.

Results: A total of thirteen workers were involved in the study. 36 of a possible 52 samples (69%) were collected.

Analysis of the data using a general linear model for repeated measures, paired T-tests and a non-parametric test both showed a non-significant reduction in urinary 1-hydroxypyrene with increasing frequencies of overall changing. There were no statistically significant findings when smoking or frequency of changing of underwear was considered.

Though there was a correlation between the levels of dust and cyclohexane soluble material in the hygiene survey there was no correlation with the urinary excretion of metabolites indicating alternative routes of absorption.

Conclusions: This study showed a clinical improvement in the excretion of 1-hydroxypyrene with increased frequency of overall changing. This was not statistically significant.
There are indications that absorption of PAY by routes other than the respiratory one are a substantial contributor to the total PAH load. This would lend support to the introduction of a Biological Monitoring Guidance Value as the occupational standard for exposure to PAH.

Key Words: Coke ovens, PAH, urinary 1-hydroxypyrene, work wear.