

OCCUPATIONAL CO-EXPOSURE TO SOLVENTS – THE CASE OF STYRENE AND XYLENE

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Although the health effects of single contaminants may be apparent under circumstances of high exposure, the great majority of people are exposed to several chemicals simultaneously. Exposure to mixtures or co-exposure to several substances is the common feature in occupational settings. Organic solvents are widely employed in industry and are used in large quantities across the world. Occupational exposure to xylene and styrene is usual in several industries as raw materials in the production of paints, pigments and glues. Both substances have effects in central nervous system and due to this we might consider that simultaneous exposure can create a higher risk than that of a single substance due to possible interactive effects.

Occupational exposure assessment to xylene and styrene was performed in a chemical manufacturing industry of polymers. Air monitoring data related with peaks and time weighted average for 8 hours shifts (TWA8h) was obtained. Additionally, biomonitoring was also performed through the collection of urine samples. Air monitoring was done in 2 shifts, of a total of 3, through active sampling and GC-FID analysis (LOQ = 6 µg for xylene; LOQ = 18 µg for styrene). Additionally, volatile organic compounds (VOCs) were also measured with a photocatalytic sensor of 10.6 eV. Biomonitoring was performed in 17 workers and urine samples collected before and after the 8-hour shift, and methylhippuric acid (MHA), mandelic acid (MA) and phenylglyoxylic acid (PGA) were measured (LOD = 0.55 g/L for MHA; LOD = 0.16 g/L for MA and PGA). Written consents from the participants involved in this study were obtained. Peaks values were higher than the reference limits for xylene (STEL = 100 ppm) and styrene (STEL = 40 ppm): 321 and 112 ppm, respectively. TWA8h were below the LOD for most of the workplaces and for both substances. Biomonitoring values were also below the LOD. Regarding peak values, we can estimate a possible interaction considering central nervous system effects. Moreover, cytochrome P450 2E1 (CYP2E1) is an important enzyme in the metabolism of several xenobiotics. Xylene isomers are characterized by inducing CYP2E1. This cytochrome is also important for the biotransformation of styrene, since it is oxidized primarily by CYP2E1 to the genotoxin styrene oxide. Knowledge about this kind of interactions is a key aspect since in most of the workplaces the workers are exposed to mixtures and not to a single substance. This allows us to better understand the limitations of OELs in those cases where health effects are being observed even when exposure values are below the OEL.