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Occupational exposure to welding fumes in the metalo-mechanic industries in Portugal

Some studies on occupational exposure to particulate have pointed out to hazardous effects to workers, in what regards inhalable and also respirable particulate. These occupational exposure scenarios are extremely complex as they involve components inherent to the individuals, working conditions and the developed activity itself [1]. This requires the application of an integrated approach comprising diagnostic, evaluation and risk management, adapted to each specific situation [2]. Regarding welding processes, several authors have shown the existence of asthma prevalence four time higher in welders in the USA than in other population [3]. Exposure to a specific type of welding depends from several factors such as the location of ventilation and exhaust equipment, the air flux, the amount of generated fumes, the workplace area, the distance from the welding front and the welding practices themselves [4].

Bearing in mind these considerations, the following research question arises: Which is the occupational exposure to welding fumes in the metalo-mechanic industries in Portugal? This work aims to perform a characterization and environmental evaluation in a specific situation: welding processes in the metalo-mechanic industry, and identify eventual alterations on workers' health, namely:

- contribute to characterize the occupational exposure to welding fume in the Portuguese metalo- mechanic industry; - characterize occupational exposure, namely identifying relationship between performed activities and exposure type;

- to define a methodology for risk assessment adapted to this situation; - contribute to increase the knowledge on health effect on worker exposure to welding fume; bearing in mind the ultimate aim of developing efficient strategies to control exposure to particulate (within micro and nano range), thus reducing risk for human health, defining how to evaluate, and improve air quality in welding environments. In order to perform the toxicological assessment of welding processes a Nanoparticle Surface Area Monitor, TSI, Model 3550, based on diffusion charging (measuring the electrostatic charge on a sampled aerosol, mainly composed of nanoparticles) was used for monitoring the emission of nanoparticles resulting from several welding processes. This equipment indicates the human lung- deposited surface area of particles expressed as square micrometer per cubic centimetre of air ($\mu m^2/cm^3$). Although this instrument is very precise and its use has been validated for this purpose, the definite presence of nanoparticles in welding fume has to be complemented by microscopy techniques such as transmission electron microscopy (TEM), which has proved very helpful in order to establish the size, shape and aggregation habit of sampled aerosols, as well as energy dispersive X-ray spectroscopy (EDS) for performing the chemical analysis of collected nanoparticles. The NanoScan SMPS Nanoparticle Sizer, Model 3910 from TSI Incorporated is a small, portable instrument developed to provide an affordable method to measure the size distribution of nanoparticle emissions in the workplace. Small, lightweight, and battery powered, the NanoScan SMPS provides real-time particle size measurement and concentration data. Information on the size distribution of airborne nanoparticles can help differentiate between nanoparticles from emission sources and background airborne particulates

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