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Occupational and Environmental Exposures of Skin to Chemicals - 2005

Abstract for Poster 27

Development of a hand wipe method for PAHs using corn oil and modified NIOSH Method 5506

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Polyaromatic hydrocarbon (PAH) compounds are present in a variety of petrochemical mixtures to which workers are potentially exposed. We identified a need for an efficient and sensitive sampling method for determining PAHs on the skin and other surfaces.

One approach that had previously been used applied food grade corn oil to the skin, removing oil and any PAHs on the skin by sorption with a Whatman filter paper, and liquid chromatographic analysis. We have optimized NIOSH Method 5506 for analysis of pyrene and benzo[a]pyrene in corn oil, using maximum fluorescence excitation and emission frequencies of 328/394 nm and 365/410 nm, respectively. Pyrene and benzo[a]pyrene are two predominant PAHs in used gasoline engine oil (UGEO) that we have measured at concentrations up to 0.1% w/v, thus representing a potential hazard to automotive repair technicians. Using the optimized conditions for detection of pyrene and benzo(a)pyrene, the lower limit of detection and limit of quantification (LOD/LOQ) was determined to be approximately 0.6 ng / 2 ng per 100 μ L and 3 ng/10 ng per 100 μ L, respectively. Next a number of possible wiping materials were evaluated for background contamination and recovery efficiencies including Whatman filter paper, paper towels, cotton gauze, and a highly absorbent non-woven polyester fabric (Tex-wipes). There were no background levels of PAHs in any of these media and analyte recovery was acceptable from each. We then applied known amounts of UGEO that were characterized for pyrene and BaP onto volunteers hands and asked them to wipe them with the polyester wipes (3 concentrations) or Whatman filter paper (1 concentration) with three consecutive wipes that were analyzed individually to determine relative and absolute analyte recovery. Most of the applied UGEO was recovered in the first wipe, but combining up to three consecutive wipes will increase quantification of PAHs residing on the skin. Analyte recovery was independent of the loading levels that were used. On a relative basis (amount on 1st wipe compared to all three wipes) polyester wipes performed best with 73% of the recovery on the first wipe compared to 57% on the first wipe of Whatman paper. However, when all three wipes were combined, the absolute recovery of pyrene from the Whatman paper was 66% and for polyester 50%. It was unanticipated that the recovery of these PAHs by Whatman filter paper would be better than for the polyester wipes. Nevertheless, the fragility of these filter papers may still make the more rugged polyester wipes a preferred choice for field applications.

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This conference follows the success of the first [International Conference on Occupational and Environmental Exposures of Skin to Chemicals: Science and Policy](#), which was held near Washinton, DC, in September, 2002.

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