1847 THE INFLUENCE OF STORAGE TIME AND ARTIFICIAL SWEAT ON THE ERCUTANEOUS ABSORPTION OF EXPLOSIVES FROM SOILS.

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We determined the influence of sample storage time on the percutaneous absorption of C-14 labeled hexahydro-1, 3, 5-trinitro-1, 3, 5-triazine (RDX), 2, 6-dinitrotoluene (26DNT) and 2, 4, 6-trinitrotoluene (TNT) from two soil types, Yolo having 1.9% carbon and Tinker having 9.5% carbon content. RDX soil samples stored at -20C for 27 months and 62 months were compared to freshly spiked soil samples. Similarly, 26DNT samples stored 35-36 months and TNT samples stored 18 months were compared to freshly spiked samples. Approximately 10 ug/cm2 of radiolabeled compound was applied in 10 mg/cm2 of soil to freshly excised pig skin pretreated with artifical sweat (5 ul) and mounted in skin penetration-evaporation chambers. Radiolabel recovered from the dermis and tissue culture media (receptor fluid) was summed to determine percent absorption from the soils. For each compound, percent absorptions of label were highest from Yolo soil. Storage did not significantly alter percutaneous absorption values for RDX, as values were all less than 1%, regardless of soil type or age. Similarly, 26DNT absorption was 1-2% for Tinker soil and 16-18% for Yolo soil, regardless of soil age. TNT absorption was approximately 0.5% from Tinker soil and 3-4% from Yolo soil for fresh and stored samples. HPLC analysis of 26DNT in receptor fluid at maximum flux indicated no metabolism or breakdown. For TNT, extensive conversion to monoamino derivaties and other metabolites was observed. The absorption of 26DNT from low carbon soil was reduced from 16-18% to near zero without sweat pretreatment, indicating that skin surface moisture was a critical variable in determining topical bioavailability.

1848 THE INFLUENCE OF SWEAT ON THE PERCUTANEOUS ABSORPTION OF CHLORPYRIFOS FROM NYLON CARPET FIBERS.

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Enhanced absorption of chlorpyrifos following exercise and a correlation between moisture and pesticide transfer (Williams et al., 2002) have been observed. Chlorpyrifos was chosen as a surrogate for semi-volatile chemicals used indoors. The percutaneous absorption of 14C-ring-chlorpyrifos from nylon carpet fibers was measured in porcine skin penetration-evaporation cells from nylon carpet fibers. Prior to application, synthetic sweat was applied to the skin surface in half of the cells. Radioactivity was measured in receptor fluid, dermis, epidermis, tape stripping samples, and vapor trap samples from a 24-hour period. Chlorpyrifos was successfully measured from nylon carpet fibers in the penetration-evaporation cells. The sum of radiolabel recovered from the dermis and receptor fluid was considered to represent the absorbed dose. There was no significant difference ($p > 0.05$) in percutaneous absorption or evaporative loss between cells that received the synthetic sweat application and cells that were run "dry" (1.5 ± 0.45 and 28.1 ± 4.96 percent for percutaneous absorption and evaporative loss, respectively). There was significantly more ($p < 0.05$) radiolabel recovered from tape stripping (5.4 ± 2.12 vs. 2.8 ± 0.59 percent) and in the epidermis (4.5 ± 0.78 vs. 3.1 ± 0.34 percent) from cells that received the synthetic sweat application. The percutaneous absorption of chlorpyrifos was found to correlate with an empirical model previously developed with nitro-compounds from soil. The synthetic sweat treatment facilitated transfer of chlorpyrifos from a treated substrate to the skin surface, but did not effect the rate or magnitude of percutaneous absorption in this study. This work has been supported in part through the Colgate-Palmolive/SOT Award for Student Research Training in Alternative Methods

1849 DERMAL DISPOSITION OF TRIAZINE IN CUTTING FLUID MIXTURES.

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Triazine is often added as a biocide/preservative to cutting fluids formulations used in the metal machine industry. Workers involved in metal machining are not only exposed to components in these cutting fluids, but biocides such as triazine which have been implicated in occupational contact irritant dermatitis (OCID). Little is known about how these cutting fluids and their ingredients influence the dermal disposition of triazine. The purpose of this study was to assess C^{14}-triazine membrane transport when topically applied to inert silastic membranes and porcine skin in *in vitro* flow-through diffusion cell system as aqueous mineral oil (MO) or aqueous polyethylene glycol (PEG) mixtures. C^{14}-triazine mixtures were formulated with 3 commonly used cutting fluid additives; namely, 0 or 5% linear alkylbenzene sulfonate (LAS), 0 or 5% triethanolamine (TEA), and 0 or 5% sulfurized ricinoleic acid (SRA). Triazine partitioning from the formulation into the stratum corneum (SC) was significantly reduced by LAS, while SRA significantly reduced the pH of the formulation. Triazine absorption ranged from 2.24 to 3.9% dose in porcine skin and 12.61 to 18.63% dose in silastic membranes. In silastic membranes, the complete mixture significantly reduced triazine absorption in MO-based mixtures, while in PEG-based mixtures triazine absorption and apparent permeability were significantly increased. In porcine skin, triazine permeability was significantly increased for both MO- and PEG-based complete mixtures and the trend was for greater triazine absorption in more complex PEG-based mixtures. Interestingly, SRA or TEA alone significantly reduced triazine absorption in MO-based mixtures, and this interaction appears to be more additive than synergistic. Although the physiochemical experiments suggest otherwise, triazine readily permeates a homogenous lipid membrane such as the SC, while triazine permeability and absorption was significantly enhanced by the complete mixture especially in PEG-based mixtures. Supported by NIOSH Grant R01-OH-03669.

1850 ABSORPTION OF 14C- RDX FROM SOILS THROUGH HUMAN SKIN.

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Cyclotrimethylenetrinitramine (RDX), a munition compound has been detected in water and soil as an environmental contaminant at production waste disposal sites and at certain military installations. The bioavailability of a chemical from soils depends on soil composition. We studied dermal absorption of 14C- RDX from two types of soils, Yolo (low carbon, 1.9%) and Tinker (high carbon, 9.5%), in human skin *in vitro* in flow-through diffusion cells. Soils (10 mg/cm2) containing a dose (10 mg/ cm2 / 0.05 m Ci) was applied to the skin and collected as diffused receptor fluid for every 6 hr up to 24 hrs. The soil content on the skin was washed with soap water and water with cotton swabs, and radioactivity present in washings was determined. The RDX absorbed in the skin (stratum corneum, epidermis and dermis) was also determined. Our results show that a total of approximately 2 .71 % (Yolo) and 2.24% (Tinker) of applied dose from soils was absorbed in the skin (receptor fluid and skin) in 24 hr. The absorption of RDX in the receptor fluid was about 1. 4 % (Yolo) and 0.66% (Tinker) soils in 24 hrs. The total recovery of applied dose (receptor fluid, skin and washings) was about 87 % (Yolo) and 94% (Tinker). The RDX absorption from soils in the skin was low when compared to RDX in acetone (6%) (Reddy et al., 2002). This shows that the bioavailability of RDX from soils is reduced considerably. The estimated levels of RDX absorption from soils can be used to evaluate health risks associated with dermal exposure (Supported by COE, abstract does not reflect US Army policy).

1851 DERMAL ABSORPTION OF TOLUENE FROM ENAMEL PAINT IN F344 RATS.

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Toluene is a component of many paint products and there is potential for both occupational and non-occupational dermal exposure to toluene in various matrices. To understand the significance of these exposures, the dermal bioavailability of toluene was assessed in F344 male rats using a combination of real-time exhaled breath analysis and physiologically based pharmacokinetic (PBPK) modeling. Animals were exposed to toluene present in a commercial enamel paint using a 1.7-cm diameter occluded glass patch system attached to a clipper-shaved area on the back of the rat. Immediately following exposure, individual animals were placed in glass off-gassing chambers and exhaled breath was monitored as chamber concentration using an ion trap mass spectrometer (MS/MS). The exhaled breath profiles from treated animals clearly demonstrated the rapid absorption of toluene. Peak chamber concentrations, representing exhaled breath, were observed within 1 hr from the start of exposure. The PBPK model describing the exposure and off-gassing chamber was used to model the exhaled breath data. A dermal permeability coefficient (Kp) of 0.073 cm/hr was found to describe each set of exhaled breath data. In comparison, the Kp value determined for enamel paint was identical to the Kp value for aqueous toluene (0.074 cm/hr) although toluene concentrations differed significantly (25 mg/ml versus 0.5 mg/ml). To evaluate the impact of paint