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Publication date: 2019

Document Version
Peer reviewed version

Citation (APA):

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Experimental verification of the dermal uptake of indoor chemicals from air

Gabriel Bekö, Charles J. Weschler, Glenn Morrison

ABSTRACT
Exposure of building occupants to manufactured chemicals in the indoor environment can occur via non-dietary ingestion (e.g. indoor dust), inhalation and dermal absorption including dermal uptake directly from air. Dermal uptake of semivolatile organic compounds (SVOC) received limited attention compared to volatile organic compounds and therefore this exposure pathway is often neglected in SVOC exposure assessments. Modeling efforts indicate that direct uptake of certain SVOCs from air may occur. Experimental verification of this hypothesis is emerging. Using human subject experiments under controlled laboratory conditions coupled with biomonitoring, the fraction of the total SVOC intake attributable to a specific exposure pathway can be isolated. One such study has demonstrated that for human participants following a 6-hr dermal-only exposure to elevated gas-phase concentrations of DEP and DnBP, the levels of their metabolites in urine samples collected over the next two days were roughly half those measured in urine samples following a 6-hr dermal plus inhalation exposure. Meaningful dermal uptake from air was demonstrated in a similar fashion for nicotine. These studies indicate that dermal uptake of certain common manmade chemicals present in indoor air can be comparable to or larger than the corresponding intake from inhalation. Substantial interpersonal differences in uptake and excretion pattern were observed. Skin washing following exposure may decrease exposure, but quantifying its effect warrants further experimental work. The talk will summarize the findings of these human subject experiments that uniquely probed the dermal uptake of SVOCs directly from air.