

Estimation of Dermal Exposure Rates of Cosmetic Ingredients –Risk Tradeoff Assessment for Plasticizers in Nail Polish–

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Phosphorus-based compounds are ubiquitously found in indoor environment owing to their various applications (e.g., plasticizer and flame retardant), which are taken via various exposure routes. Conventionally, dust ingestion and inhalation are known as dominant exposure routes for these compounds. In this study, the dermal exposure to phosphorus-based compounds via using nail polish was quantitatively investigated as an alternative exposure route. The concentrations of phosphorus-based compounds in 45 nail polishes purchased from Japanese market were determined. Triphenyl phosphate (TPhP) were detected from the nail polishes made in USA, whose concentrations ranged 1.1–1.8 wt%. The potential dermal exposure rates of TPhP via using the nail polishes were estimated by using ConsExpo (Consumer Exposure Model v 5.0). The potential dermal exposure rates ranged 200 (5%ile)–1700 (50%ile)–5000 (95%ile) ng kg-bw⁻¹ day⁻¹, which were more than 1400 times higher than the exposure rates via dust ingestion and inhalation previously reported. Margin of exposure (MOE) was 3.6×10⁵ (5%ile)–4.1×10⁴ (50%ile)–1.4×10⁴ (95%ile). As a comparison, the potential dermal exposure rates of dibutyl phthalate (DBP) and acetyltributylcitrate (ATBC), which are conventional and alternative plasticizers, respectively, were also estimated. The potential dermal exposure rates of DBP and ATBC ranged 360–3500–14000 and 430–4100–17000 ng kg-bw⁻¹ day⁻¹, respectively. MOEs of DBP and ATBC were 4.1×10³–4.2×10²–1.1×10² and 2.3×10⁵–2.4×10⁴–5.9×10³, respectively. The dermal exposure to TPhP via using nail polish could be a significant exposure route and source for phosphorus-based compounds.