

The use of multizone models to estimate an airborne chemical contaminant generation and decay profile: Occupational exposures of hairdressers to vinyl chloride in hairspray during the 1960s and 1970s.

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Vinyl chloride (VC) was used as a propellant in a limited percentage of aerosol hairspray products in the United States from approximately 1967 to 1973. The question has arisen whether occupational exposures of hairdressers to VC-containing hairsprays in hair salons were sufficient to increase the risk for developing hepatic angiosarcoma (HAS). Transient two-zone and steady-state three-zone models were used to estimate the historical airborne concentration of VC for individual hairdressers using hairspray as well as estimated contributions from other hairdressers in the same salon. Concentrations of VC were modeled for small, medium, and large salons, as well as a representative home salon. Model inputs were determined using published literature, and variability in these inputs was also considered using Monte Carlo techniques. The 95th percentile for the daily time-weighted average exposure for small, medium, and large salons, assuming a market-share fraction of VC-containing hairspray use from the Monte Carlo analysis, was about 0.3 ppm, and for the home salon scenario was 0.1 ppm. The 95th percentile value for the cumulative lifetime exposure of the hairdressers was 2.8 ppm-years for the home salon scenario and 2.0 ppm-years for the small, medium, and large salon scenarios. If using the assumption that all hairsprays used in a salon contained VC, the 95th percentile of the theoretical lifetime cumulative dose was estimated to be 52–79 ppm-years. Estimated lifetime doses were all below the threshold dose for HAS of about 300 to 500 ppm-years reported in the published epidemiology literature.

KEY WORDS: Airborne contaminants; exposure modeling; hairdresser; three-zone model; two-zone model; vinyl chloride