

Identifying Important Factors Influencing Children's Exposures to Pesticides

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Issue

- Insufficient data on children's exposures and activities make it difficult to adequately assess multimedia exposures to environmental contaminants.
- As a result, regulators must rely upon a series of default assumptions and exposure factors when conducting risk assessments.
- The National Exposure Research Laboratory (NERL) has supported extensive research with the aim of replacing assumptions with defensible data to reduce uncertainties in aggregate exposure estimates.

Approach

- The Children's Exposure Research Program in NERL has conducted or supported numerous field and laboratory studies to 1) identify pesticide use patterns, 2) measure pesticide concentrations in homes and day care centers, 3) describe spatial and temporal distributions of residues following applications, and 4) evaluate existing approaches for estimating dermal and non-dietary exposure.
- We have assembled the data from these studies and performed analyses to identify the exposure pathways and activities that strongly impact children's exposures and to evaluate other factors that influence exposures. Some highlights are presented in this poster.

Results

- Inhalation exposures are strongly influenced by the physicochemical properties of a compound (Fig. 1). The logged vapor pressures of several pesticides of various compound classes soundly predicted the mean concentration measured in indoor air in the CTEPP studies ($r^2 = 0.68$)

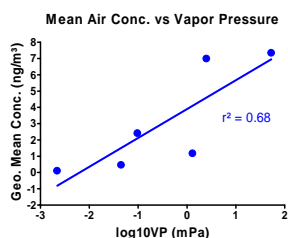


Figure 1. Vapor pressure is a strong determinant of airborne concentration.

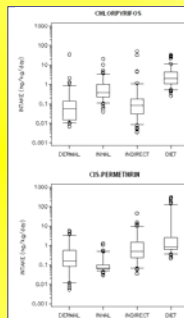


Figure 2. Estimated daily intake by route.

- The importance of the Indirect ingestion route is greater for pyrethroids, such as Permethrin, than for organophosphates, such as Chlorpyrifos. Estimated daily intakes are displayed in boxplots (Fig. 2) comparing route-specific distributions and in piecharts (Fig. 3) showing percent of total intake by route.

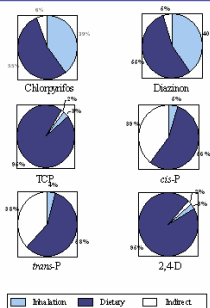


Figure 3. Estimated percent of aggregate intake by route.

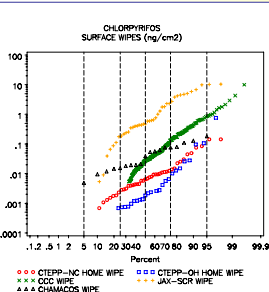


Figure 4. Log-probability plot comparing surface wipe measurements across studies.

- Seemingly minor modifications of a measurement technique may sharply affect results (Fig. 4). Reduction in the amount of solvent used with surface wipes from 10 ml (typical) to 2 ml (CTEPP) produced results that were about one order of magnitude lower than those measured in other field studies (including the population-based Child Care Center study).

- The importance of an exposure route may vary with exposure level. As estimated aggregate intake of permethrin in CTEPP increased (Fig. 5), the contribution of the indirect route to total intake also increased, and the contribution of the dietary route decreased. Among the few most highly exposed individuals, however, the dietary route was dominant.

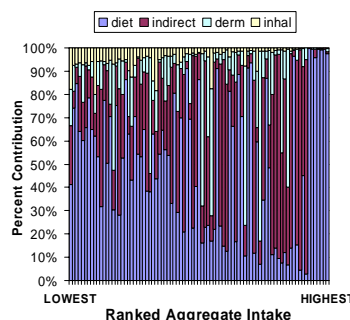


Figure 5. Route-specific percent contribution to aggregate intake.

Expected Impact

- We expect that our analyses will benefit the EPA Program Offices, including the Office of Pesticide Programs and the Office of Children's Health Protection, in their risk assessment and management activities, allowing them to replace critical default assumptions with high-quality, real-world data.
- Fewer default assumptions will produce more accurate exposure and risk assessments, strengthen regulatory actions aimed at reducing risk, and help ensure that pesticides are appropriately regulated.



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