Abstract

Toward the Rational Use of Exposure information in Mixtures Toxicology

AUTHOR (LAST NAME, FIRST NAME): Tornero-Velez, Rogelio
National Exposure Research Laboratory, U.S. EPA, Office of Research & Development, Research Triangle Park, NC

Of all the disciplines of toxicology, perhaps none is as dependent on exposure information as Mixtures Toxicology. Identifying real world mixtures and replicating them in the laboratory (or in silico) is critical to understanding their risks. Complex mixtures such as cigarette smoke, diesel exhaust, and disinfection byproducts may be replicated without difficulty because they are uniquely associated with reproducible processes such as combustion. On the other hand, chemical mixtures that arise from multiple sources are less tractable. Toxicologists often are faced with developing ad hoc rules for constructing test mixtures, or they simply test a few binary combinations. We examined monitoring data for pesticides in daycares (CCC) and homes (AHHS) and the evidence that points to patterns in how they group. We applied approaches from the field of community ecology to test if these assemblages of "chemical species" are random or structured. Presence-absence matrices developed from CCC and AHHS datasets indicated structure comparable to the West Indian Finch matrix when species diversity metrics were applied; namely, the COMBO metric (number of unique combinations) and CHECKER metric (number of 2x2 checker matrices). This finding indicated that factors (e.g., social, economic, and technical) limit the spectrum of pesticide combinations observed in these datasets. Additional methods were used to identify frequently occurring k-way combinations of pyrethroids in the CCC dataset. These approaches were used to inform pharmacokinetic studies and a cumulative probabilistic exposure-dose assessment.