Dust: A Metric for Use in Residential and Building Exposure Assessment and Source Characterization

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Environmental Health Perspectives Volume 110, Number 10, October 2002
Assumptions

- Settled dust (removable residue)
- Route of entry via ingestion (hand-to-mouth)
- Primarily assessing the hazards to infants & children
- Goal of selecting the most appropriate method – if possible
Selected Contaminants

- Lead, Beryllium etc.
- Pesticides
- PCBs
- Allergens (dander, frass, proteins in saliva or urine)
- Fungal Spores
- Bacteria
Source Differentiation

- Structural markers – size, shape or morphology (crystalline vs. amorphous)
- Location – surface or stratified (rugs or fabric)
- Activity patterns – disturbed (wear surface) or undisturbed (accumulated over time)
Contaminant Characterization

• Qualitative vs. Quantitative
• Surface loading - mass/area
• Concentration – mass/mass
• Subsidiary concerns: collection efficiency & accuracy (multiple sample collectors)
Questions

• Is the collection method appropriate?
• Wet (high efficiency) vs. dry (lower efficiency)
• Representative of exposure pathway?
• All particle sizes (mass) or a specific size range (most likely to adhere to skin or have the optimum surface/mass ratio for uptake)
Standard

- Measure the surface of the contact area
- Approximate contact pressure
- Dry or wet (sticky)
- Maximum surface loading is limited
- $2^0$ means of transfer (wet – saliva or hand wash with solvent)
HEPA Sock for Rugs/Fabrics

- Socks are “tared” or pre-weighed
- Assembled in the field with the HEPA (white) section downstream
- Connected to a vacuum cleaner
- Collect within the area of a template
- Indiscriminate (collects junk)
Micro-Vac

- Connected to an air-sampling pump
- 37 mm closed face cassette with “nozzle”
- Filter media specific to desired analysis
- Surface loading & concentration with pre-weighed filter
- Best efficiency @ < 250\(\mu\text{m}\) particle size
Surface Wipes

- Used for surfaces that can be wiped “clean”
- Remove from pouch, open, refold and wipe in a consistent pattern
- Use a template to define surface area
- Always use gloves & change between wipes
- Surface loading $ug/cm^2$
Wipes

- Best for non-abrasive, smooth or textured surfaces
- Standard (wet) wiping material
- Wipe in a specified pattern inside of a template
- Can adjust for irregular (i.e., not flat) surfaces like windowsills
- Yields surface loading data
Figure 1. The revised LWW sampler.
LWW Sampler

- For horizontal & vertical flat surfaces
- Greater accuracy due to the use of the template and no operator pressure
- Substance specific wiping substrates
- Determination of surface loading (mass/area) and concentration (mass/mass) of contaminant in dust with pre-weighed wipe
Methods Review Paper

- EPA 747-R-95-007 (September 1995)