

US EPA ARCHIVE DOCUMENT

Over and Under Estimation Bias from Passive Dosimetry

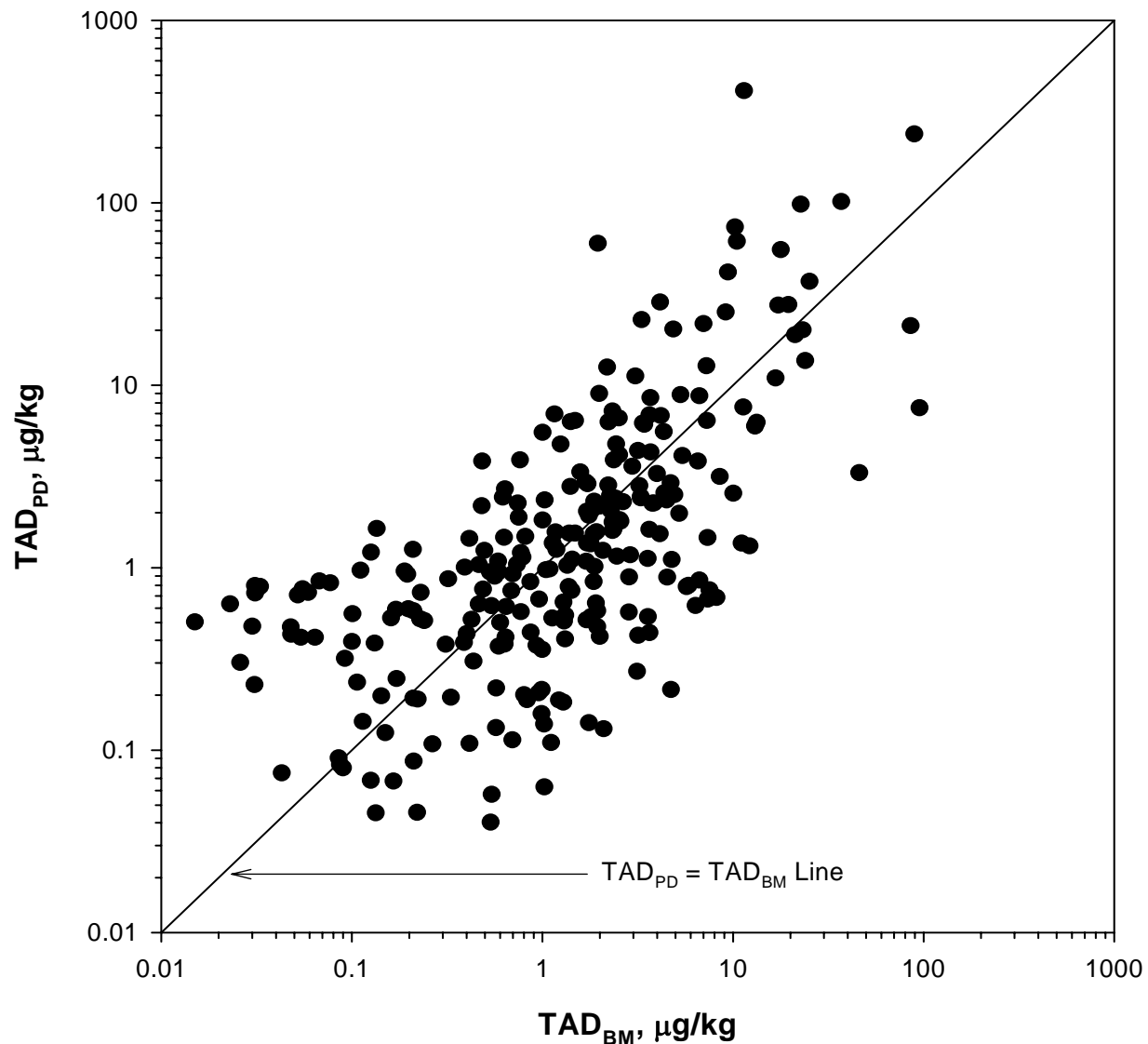
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on behalf of AHETF for
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Passive Dosimetry

- Air Monitoring
- Clothing Dosimeters (Inner and/or Outer)
- Hand Washes
- Face/Neck Wipes

- These methods have been established with both national and international input from experts
- For reasons presented, dermal methods in use are valid
- Biomonitoring is not viable for a generic database and cannot be done with most compounds
- Concurrent passive dosimetry vs. biomonitoring shows that PD neither over nor under predicts (Ross et al., 2007)

Correlation of Concurrent PD with BM



Dermal Removal Efficiency

- Hands can represent a significant proportion of total dermal exposure, and dermal is the predominant exposure route
- Soap, water and mechanical agitation is the primary method of hygiene for removal of pesticide residues on hands (per label, MSDS)
- There is a LARGE body of GLP data available to regulators to determine the removal efficiency of pesticides from skin
 - 80+ dermal absorption studies in rats with soap and water removal
 - 10+ human/monkey dermal absorption studies with soap and water

Dermal Removal Efficiency (Continued)

- Preponderance of data has been generated with radiolabeled pesticides, because it insures accountability
- Data from 20+ human/monkey dermal absorption studies of different pesticides demonstrate <10% absorption on average following 8 hr exposure
- Data from rat studies shows that what is adsorbed is frequently absorbed, but a few compounds have bound skin residues (adsorbed) that are 2-3x greater than absorbed
- Higher exposure → reduced fraction absorbed
- Quality hand removal efficiency studies show 90+% removed

Handwash Can Overestimate Exposure

- Most measured residues would slough or wash off the hand during the work period
- Only a fraction of amount applied is dermally absorbed
- Frequently, pesticide is adsorbed to dirt on hands reducing bioavailability
- Pesticide washed off in first half of day has no opportunity for absorption, but is counted as if it did
- Any task that requires gloves reduces hand exposure 10x or more compared to ungloved handwash

Hand Wash Removal Efficiency Study Issues

- Applying a dose to clean hands may not simulate agricultural work conditions
- Hand exposure is intermittent and does not occur as a bolus that is typical of a hand wash removal study
- Removal efficiency is related to concentration, and a worker may be exposed to both dilute and concentrate
- The only way to insure accountability of total dose is to use a radiolabeled pesticide: Do benefits outweigh risks in these intentional dosing studies?

Conclusions

- Weight of evidence indicates that dermal removal efficiency is adequate:
 - Passive dosimetry vs. biomonitoring
 - Large database not previously considered on removal efficiency available to regulators
- Questions about applicability of short-term removal efficiency (0.5 hr) to typical worker removal time (2-8 hr)
- Without reason to believe that recovery may be compromised (e.g., high reactivity, polarity or lipophilicity), a removal efficiency study is unjustified
- If hands represent 50% exposure and 10% is lost due to ad/absorption, underestimation is 5% and is negligible