Navigating the nuances of dermal exposure assessment

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Dermal Sampling Methods

- End of shift wipe of “seedling hand” with cloth wipe premoistened with 70% ethanol (pesticides) or deionised water (metals)
- 2” X 2” template used for back of hand and wrist wipes
- All three wipes for each subject were combined.
- Mass detected was divided by surface area



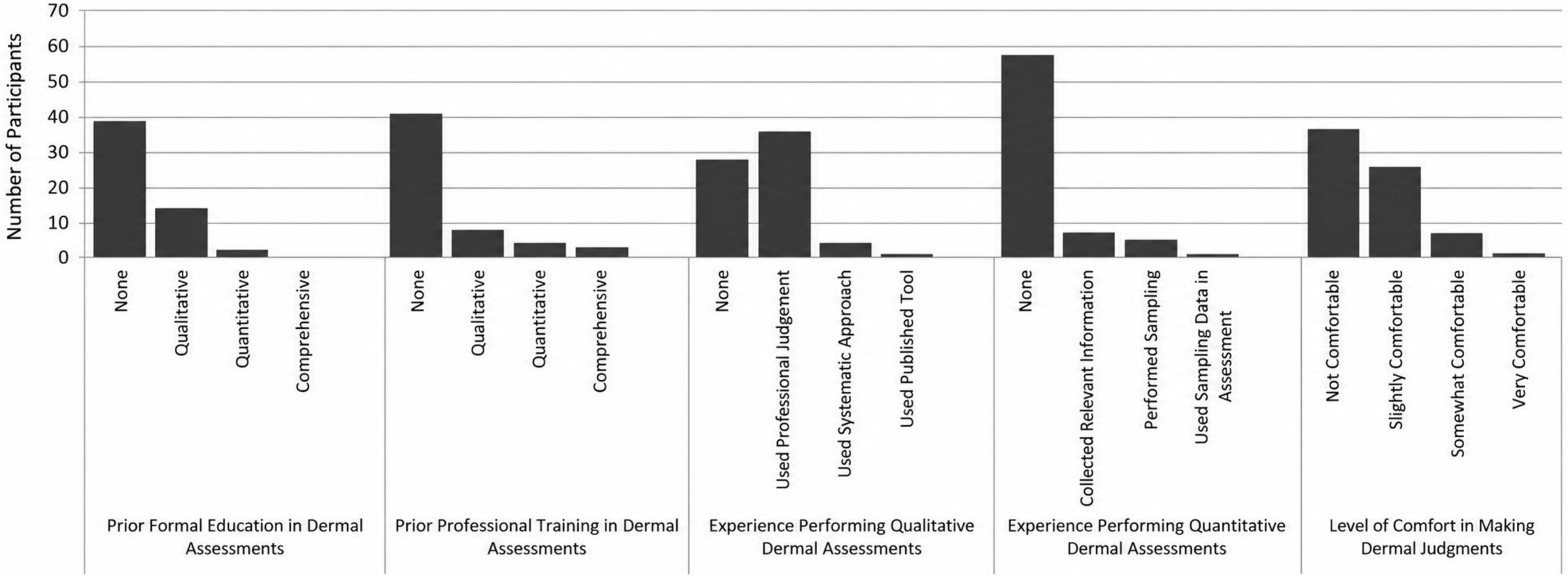


What did the dermal samples mean?

Dermal Experience

90 volunteer US Practitioners

Sahmel et al (2023)
J Occup Environ Hyg
20(3-4):143-158



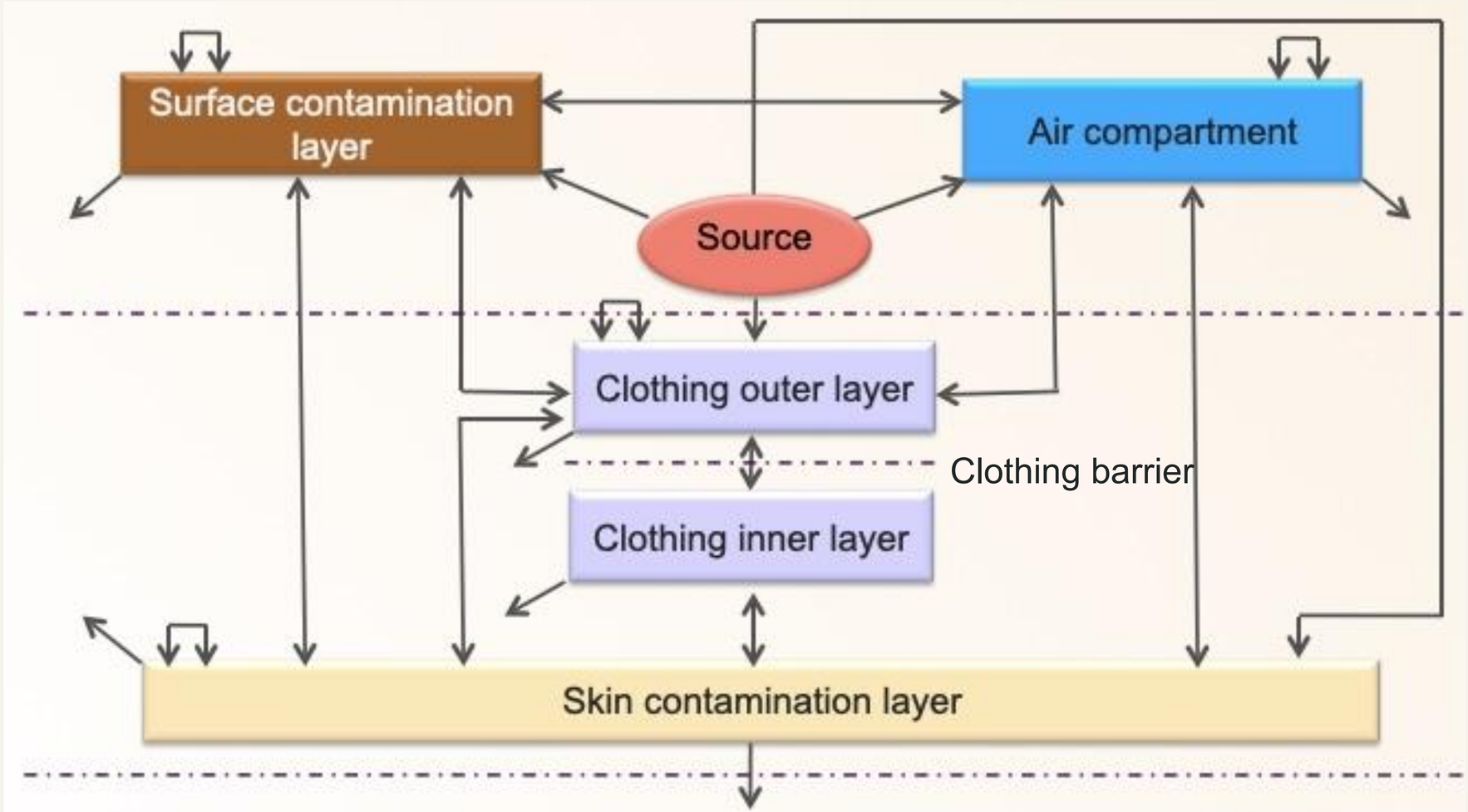


IOM



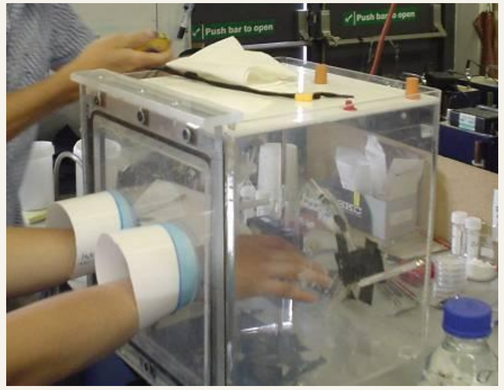
Dermal Conceptual Model

Schneider et al (1999)
Occup Environ Med
56 (11): 765-773

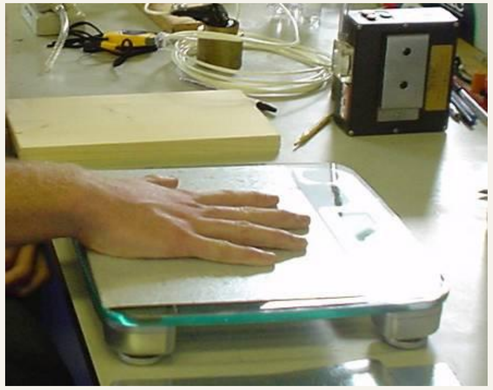


Pathways of Dermal Exposure

Deposition



Surface Contact



Immersion/Emission



Dermal Exposure Assessment Methods

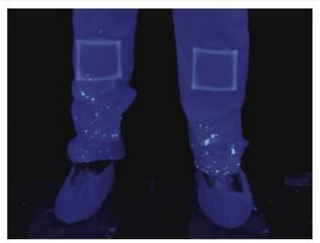
- Interception



- Removal



- In - situ

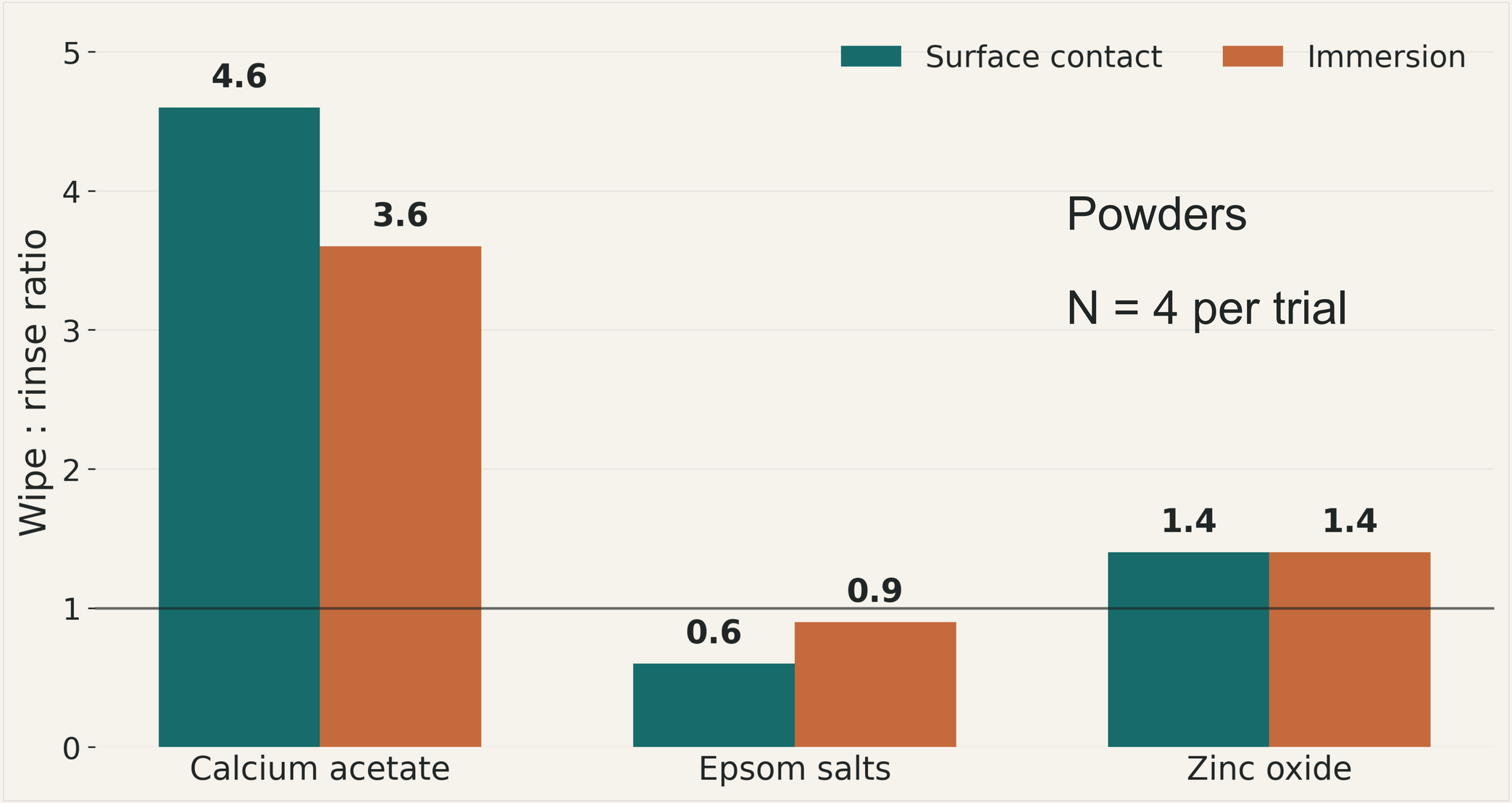


- (Biological monitoring?)

Different dermal sampling methods can give very different results

A preliminary comparison of three dermal exposure sampling methods: rinses, wipes and cotton gloves

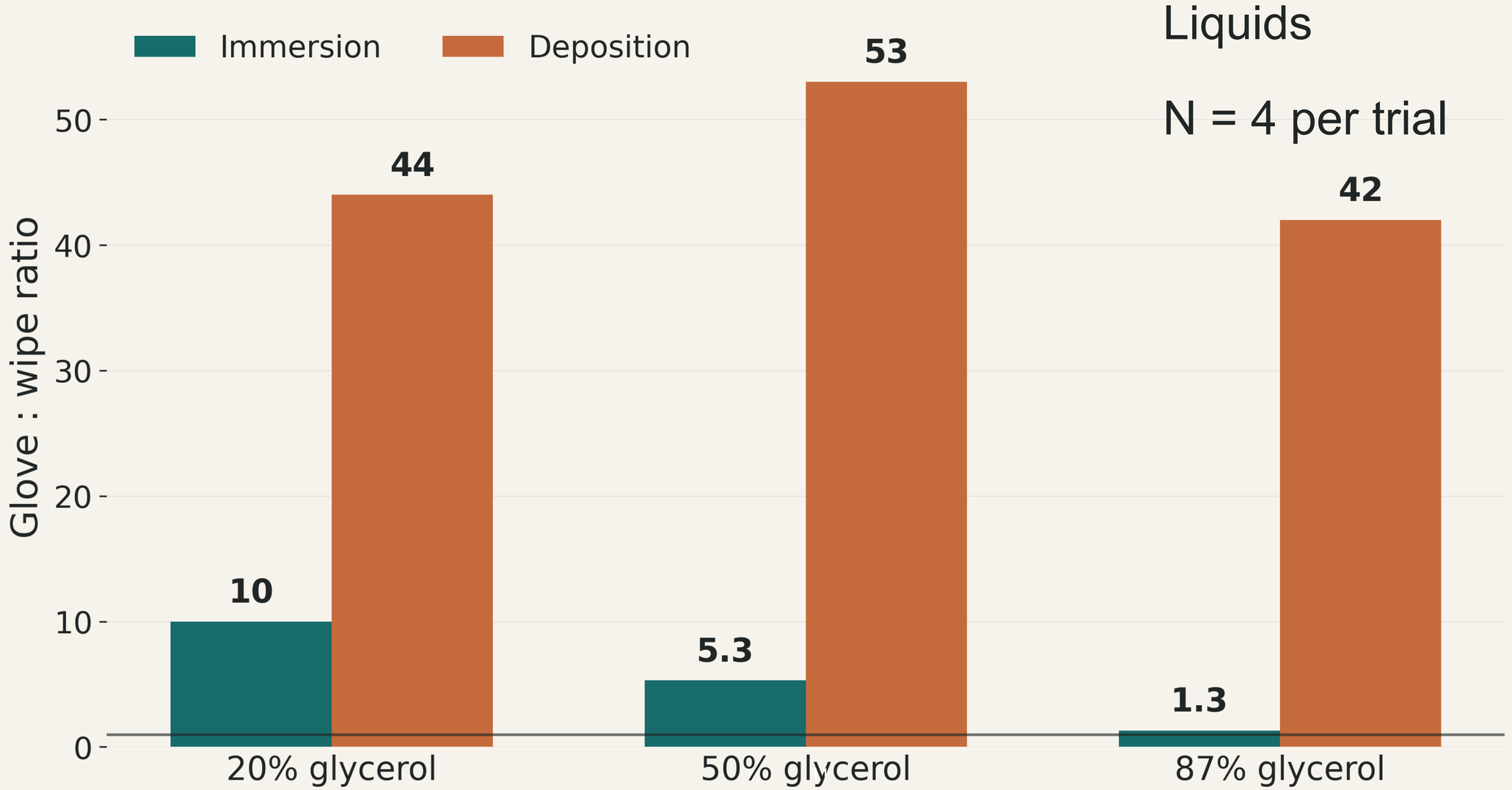
Gorman Ng et al. (2014)
Environ. Sci.: Processes Impacts, 16, 141–147



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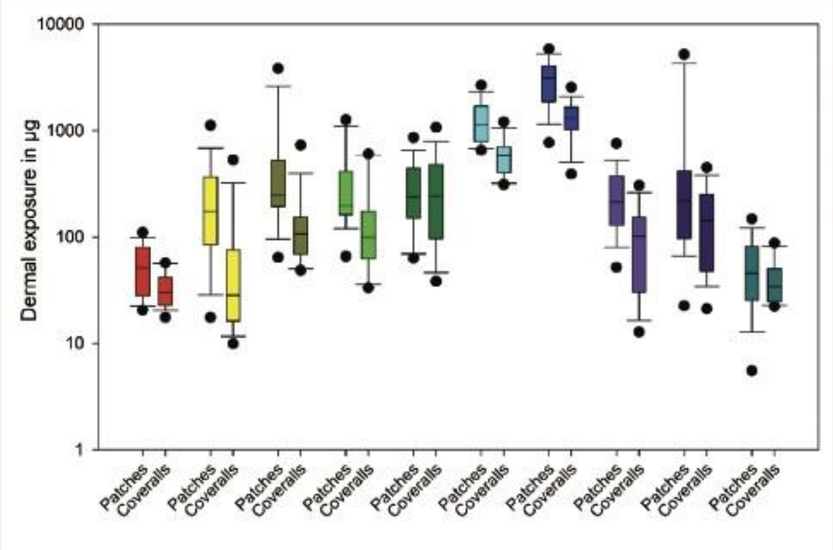
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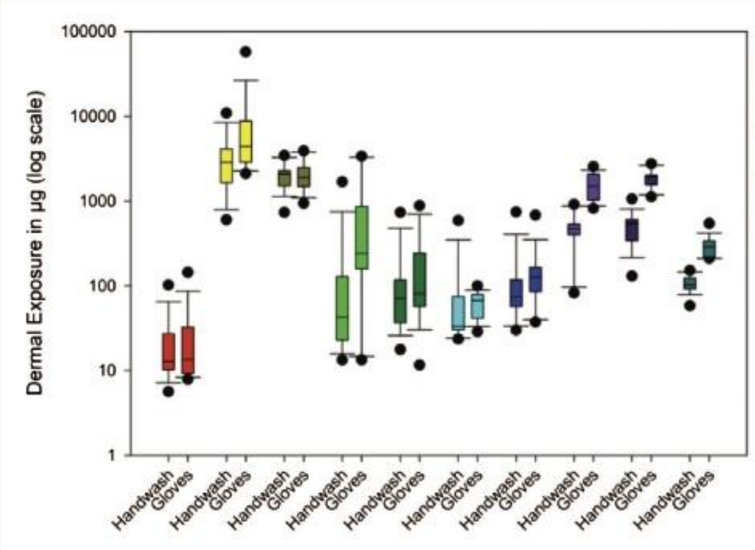


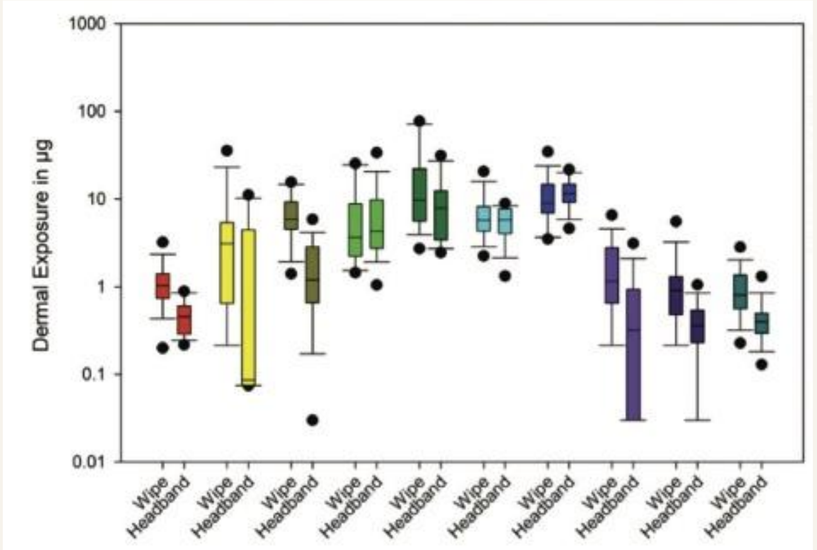
Differences can vary by task

Kasiotis et al. (2020)
Ann Work Expo Health
61(1): 55-70

Comparison of Measurement Methods for Dermal Exposure to Hazardous Chemicals at the Workplace: The SysDEA Project





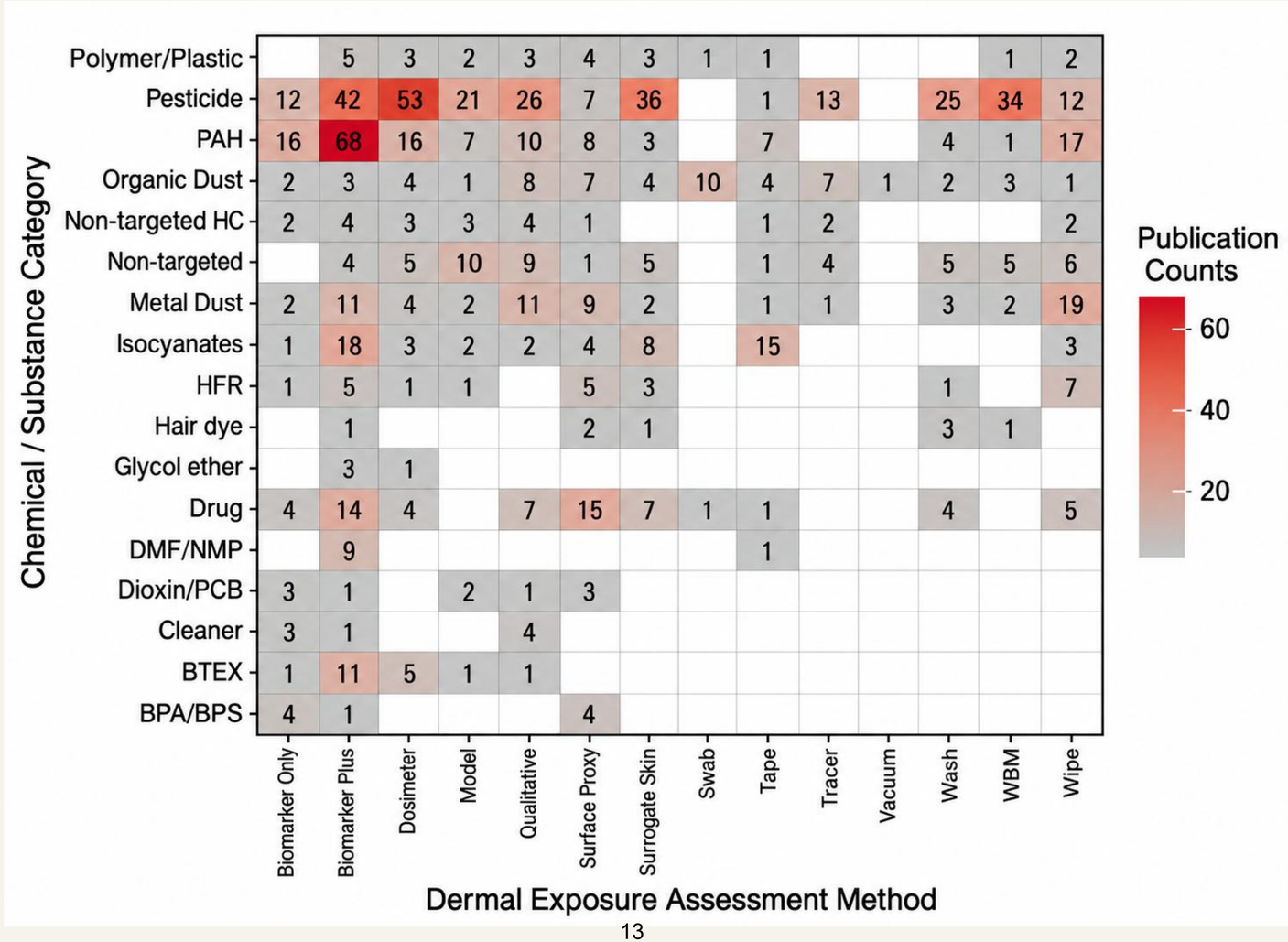




We use a lot of different methods

Therkorn et al (2024)
Ann Work Expo Health
68: 351-365

Methods to assess dermal exposures in occupational settings: a scoping review



Measured value ≠ exposure

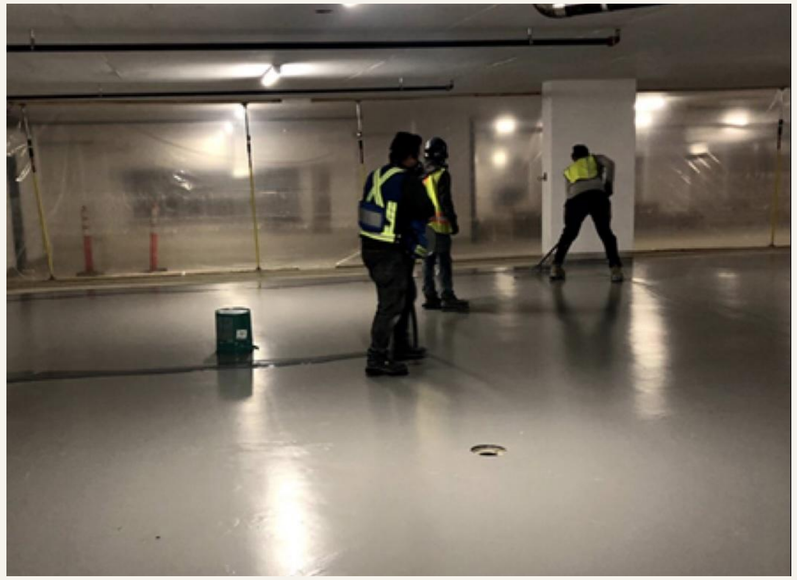
What question are you trying to answer?

- What health impacts are of interest?
- What is the absorbed dose?
- How much skin surface area is affected?
- What body parts are affected?
- Where/when is exposure occurring?
- Is the PPE effective?
- Are some workers more exposed than others?









We understand how dermal exposure works better than we can measure exposure

BS EN ISO 13977-1:2026

Table F.2 — Process/pathway analysis in relation to selection of measurement methods

Removal, resuspension or evaporation rates[a]	Uptake rates[b]	
	High	Low
High	Interception	Interception
Low	Interception	Interception Removal

[a] Evaporation rates are derived from physicochemical data.

[b] Uptake rates are derived from kinetics data.

Table F.3 — Proposed sampling methods for risk assessment purposes

Removal, resuspension or evaporation rates	Uptake rate	
	High	Low
High	Biomonitoring	Biomonitoring
Low	Interception (In situ)	Removal (In situ)

So what do we do?

1. **Start with the question, not the method.**

2. **Use measurement when it will improve the decision**

3. **Don’t mistake lack of precise quantification for lack of knowledge.**

