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Oily hands

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IOM

LEADERS IN IDEAS AND SOLUTIONS

Problem…

- *How much oil gets on your hands when you fill up a vehicle with diesel or add oil to the engine?*
- These are common tasks undertaken by professional drivers and consumers, and knowledge of the exposure is a key element in the risk assessment. It is difficult to reliably estimate exposure.

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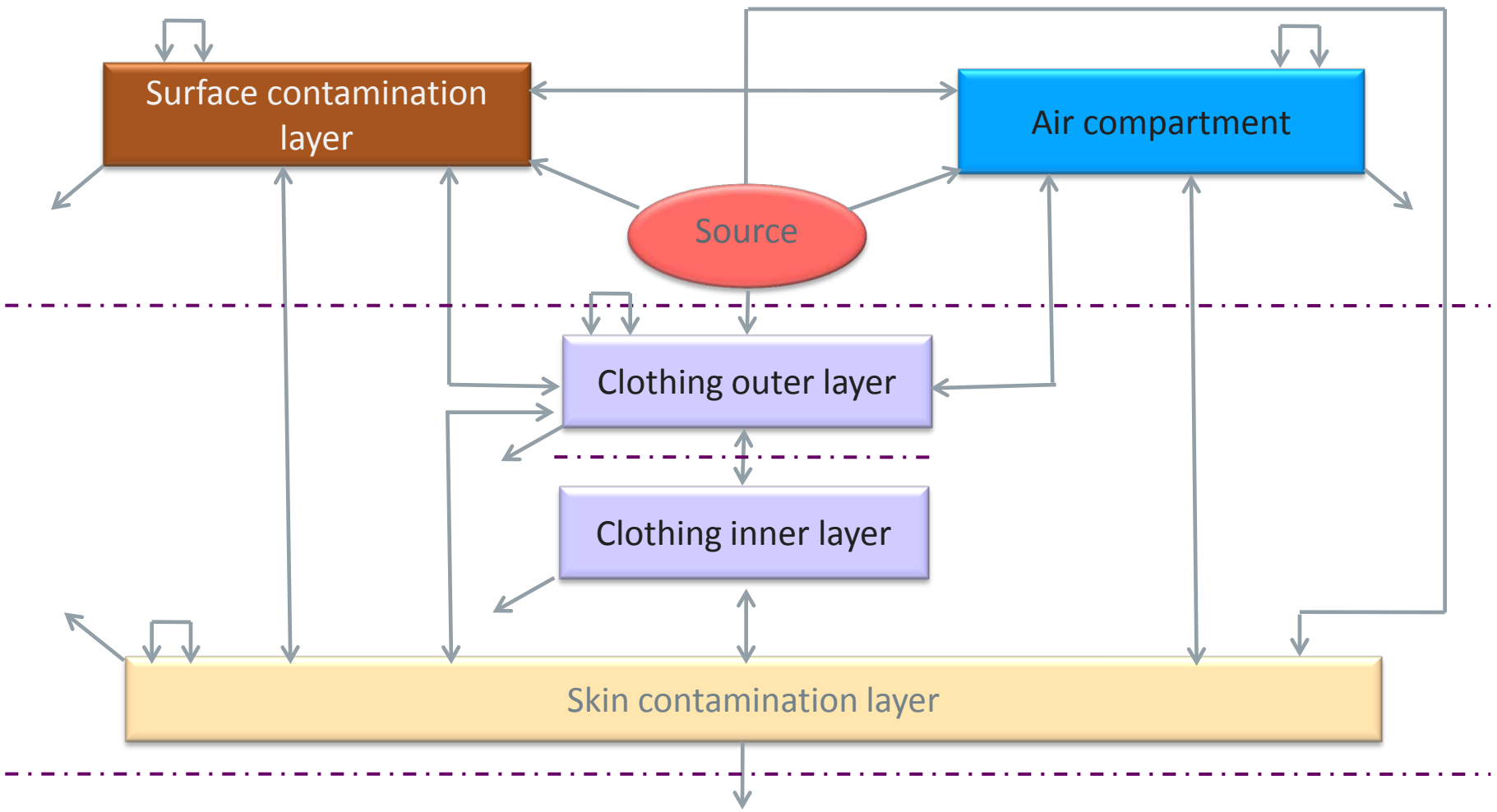
What do you think?

Sources, pathways and routes

- Outdoor motor vehicle > outdoor air > breathing zone > inhalation

- Glue pot > contaminated surface > skin contamination layer > dermal uptake



Schneider et al. Conceptual model for assessment of dermal exposure. Occup Environ Med (1999) vol. 56 (11) pp. 765-73

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So, what do you think are the sources and pathways?

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Modelling exposure…

- There are a few model tools available to estimate dermal exposure
- None are really satisfactory
- RISKOFDERM tool is recognised as a Tier 1 model for REACH
- For the filling, mixing and loading DEO: median = 20.6 mg; 90th percentile = 179 mg

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What could we do to get a better estimate?

- Measure the dermal exposure using one of three approaches:
  - interception methods such as patches
  - removal such as washing or wiping, and
  - visualisation involving fluorescent dyes
- What would be the best approach for this situation?

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Removal techniques…

- Washing – hands
  - flow into a capture container
  - use water or solvent
- Rinsing – hands
  - in bag
  - use water or solvent
- Wipe – any body area
  - travel/baby wipes or dry cloth
- Stripping skin – any body area
  - adhesive tape
  - measures percutaneous absorption not exposure

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Removal techniques…

Figure 8.8 Typical hand washing procedure. The hand is placed in a sealable bag containing a known volume of an extracting solvent such as water or alcohol/water mixture. Vigorous shaking (for a predetermined time) is needed to dislodge the contaminant from the skin into the extracting solvent. The resulting mix can be subjected to a suitable analytical procedure.

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Removal techniques…

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Removal efficiency…

- Ranges from 40-95%
- Depends on
  - loading
  - time of residence on the skin
  - material/solvent type used
  - number and duration of wash/rinse/wipes
  - operator variability: eg pressure of wipe

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Results from wipe testing on simulated vehicle refueling…

		AM ($\mu g/cm^2$)	GSD	MIN	MAX
Pre	Left	0.29	1.32	0.25	0.89
	Right	0.29	1.29	0.25	0.78
Post	Left	15.97	10.18	0.25	96.21
	Right	8.46	5.70	0.25	44.64

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Mass on hands…

- The measured mass on the hands and forearms ranged from 0.5 to around 80mg
- Arithmetic mean 23mg

Some ‘high’ masses reported

- Through touching nozzle/hose connection
- What does this mass of contamination look like? Mass– 80mg

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What does it look like on the hand?

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and a couple minutes later….

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Is there any risk to health?

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Uptake is low…

- Uptake through the skin is relatively low from oils, and there is a time lag before components of the oil mixture, e.g. PAHs, are absorbed

- The Derived No Effect Level (DNEL) for dermal exposure to diesel is 2.9 mg/kg/day. These exposures are all much lower than the DNEL.

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References

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- Schneider, T., Vermeulen, R., Brouwer, D.H., Cherrie, J., et al. (1999) Conceptual model for assessment of dermal exposure. Occupational and Environmental Medicine. 56 (11), 765–773.
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