Chronic exposure of healthy participants to semi-volatile organic compounds model using an optimized aerosol delivery system

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Introduction

- Semi-volatile organic compounds (SVOCs) can be hazardous chemicals.
- SVOCs are present in a plethora of professional and household products, and are omnipresent in indoor air.
- Toxicological inhalation studies with SVOCs are lacking.
- Human toxicokinetic data give insight into doses from exposures.
- A portable SVOC aerosol delivery system (ADS) was optimized for human inhalation studies.

Aim

Assess the feasibility of performing repeated SVOC inhalation exposures at the participants' home over a week using our ADS.

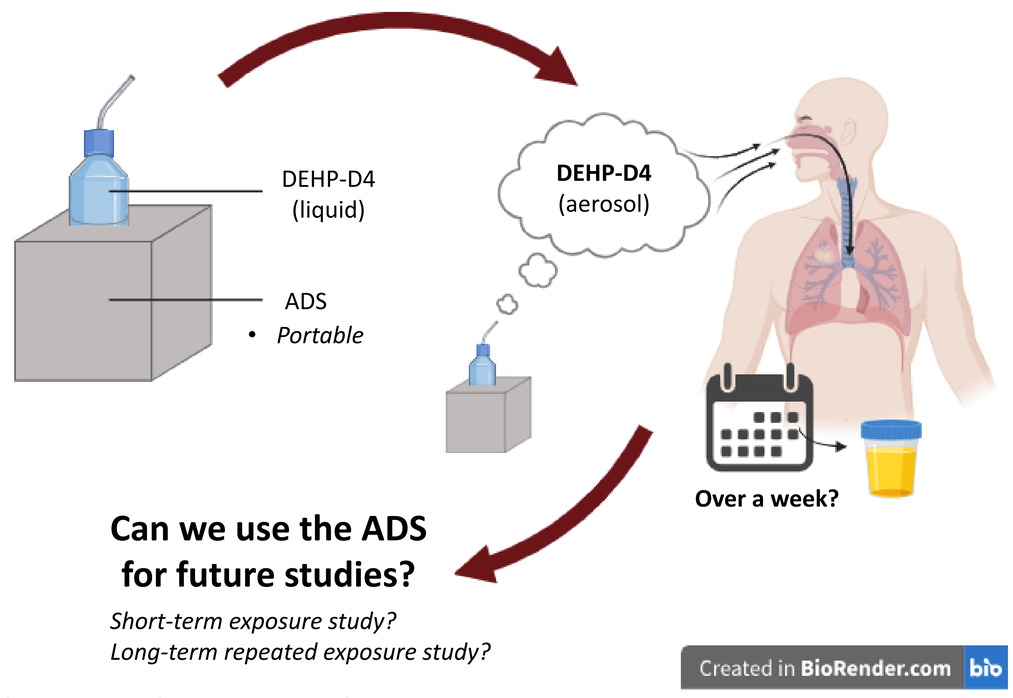


Fig1. Experiment overview

Methods

Chemicals – liquid composition

50:50 propylene glycol and vegetable glycerin, 1% (w/w) ethanol, and 0.02% (w/w) ring-deuterated di(2-ethylhexyl) phthalate (DEHP-D4) used as SVOC model.

Experimental design:

- 4 participants (n=4)
- 2 DEHP-aerosol inhalations (40 puffs in 10 minutes) per day at home (morning and evening) for 4 days. Participants' exposures were below the Swiss DEHP occupational exposure limit (2 mg/m^3).
- 1 urine sample before exposure (day 1) and then,
- 4 urine samples per day (upon waking, at noon, late afternoon and close to bedtime) for 4 days.

DEHP metabolites quantification in urine samples

- Mono(2-ethylhexyl) phthalate (MEHP-D4)
- Mono(2-ethyl-5-hydroxyhexyl) phthalate (5OH-MEHP-D4)
- Mono(2-ethyl-5-oxohexyl) phthalate (5oxo-MEHP-D4)
- Mono(2-ethyl-5-carboxypentyl) phthalate (5cx-MEPP)

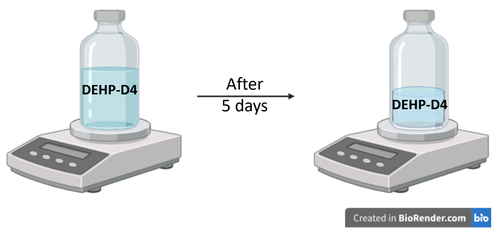
Perspectives & conclusion

- Modify the ADS to avoid DEHP-liquid leakage.
- Add vaping training sessions to decrease the exposure dose intervariability.

✓ Our ADS can be used to conduct toxicokinetic studies.
✓ Long-term inhalation exposure studies with our ADS are recommended to assess possible metabolites accumulation in humans.

Results

1. Exposure dose



Participant ID	Inhaled DEHP-D4 mass (mg)
1	0.376
2	0.312
3	0.160
4	-
Mean	0.283

Fig2. DEHP dose estimations (left) and inhaled DEHP-d4 mass (right).

- Participant ID 3: superficial inhalations
- Participant ID 4: DEHP-liquid leakage (no exposure dose)

2. Urinary metabolite concentrations

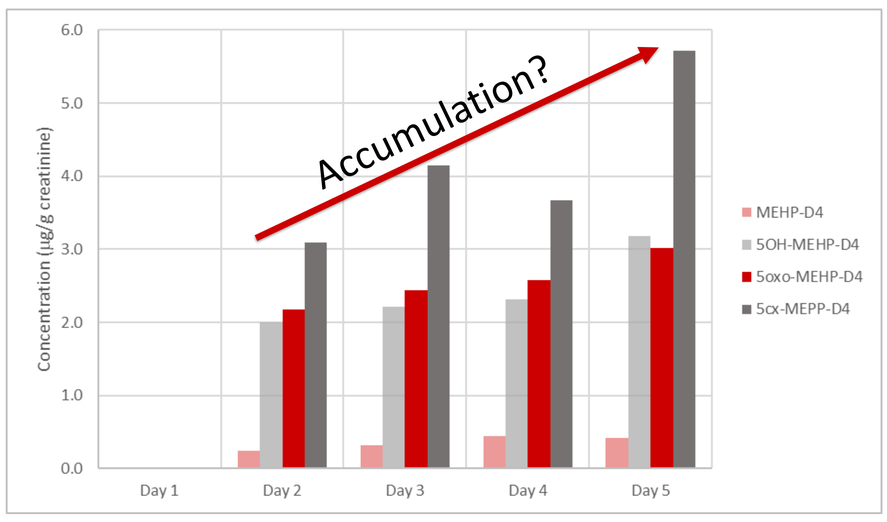


Fig3. Labelled metabolite concentrations in morning urine samples over time for participant ID 1.

- The four labelled metabolites were found in urine samples of all the participants following the first inhalation exposure.

3. Feedback from participants

- ADS is an easy-to-use system
- Simple to understand procedure (exposure and sample collection)

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