Assessment of endocrine effects following the exposure to indoor dust samples of different polarities, particle size, and bioaccessible extracts

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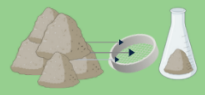
INTRO

- Indoor microenvironments contain a wide spectrum of chemicals released from appliances, furniture, building materials, etc.
- Once released, these chemicals may be a(b)dsorbed (on)into dust particles
- Some chemicals found in dust have been linked with potential to disrupt endocrine system
- Mainly toddlers represent a risk group due to sensitive stage of life and frequent hand-to-mouth behavior

STUDY DESIGN

1- Dust samples were collected from cars, houses, kindergartens, flats, public spaces, and schools



2- Pooled dust samples from different microenvironments were sieved into two different size fractions; fine (<0.25mm) and bulk (<2mm) particles

3- Different extracts were derived: Both, fine and bulk samples were extracted in either MetOH or Hexane Acetone (1:1) using ultrasonic bath to recover polar and nonpolar chemicals, respectively.
Moreover, physiologically based extraction tests (PBET)[1] emulating the gastric and intestinal environment were performed on the fine particles to assess the potential bioaccessibility of chemicals

4- The potential endocrine-disrupting properties of the extracts were evaluated using human cell lines stably transfected with a reporter gene under the control of the Aryl hydrocarbon Receptor (AhR)[2], Androgen Receptor (AR)[3], Estrogen Receptor (ER)[4], and Thyroid Hormone Receptor (TR)[5] to assess the dioxin-like, anti/-estrogenic, anti/-androgenic and thyroid hormone disrupting effects, respectively. Additionally, the displacement of the thyroxin (T4) from its transporter – transthyretin (TTR), was also assessed

RESULTS

- Extracts from all microenvironments triggered effects on AhR, ER, anti-ER and TTR displacement (Fig.1, 3, 6, 7)
- Fine fractions mostly presented higher effects than the bulk samples
- Polar (MeOH) extracts showed frequently greater effects across the different modes of action (Fig.1-7)
- Dust from cars elicited effects on most endpoints, with specific patterns
- Samples from flats were able to, simultaneously, agonize AR and antagonize ER
- The organic extracts elicited higher effects when compared to the PBET extraction
- Bioaccessible fractions were active on AhR across all microenvironments

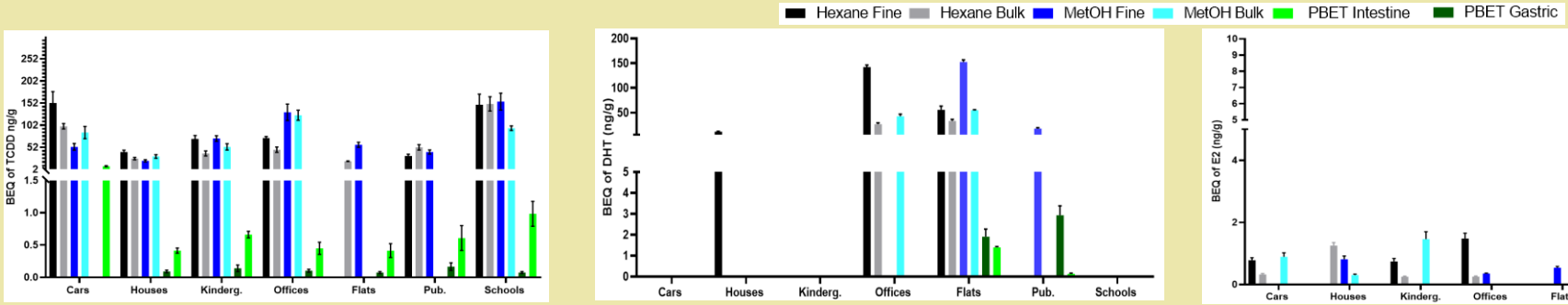


Fig 1. Arylhydrocarbon receptor-mediated activity expressed as Bioanalytical Equivalent concentration [BEQ] of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD); missing columns <LOQ (Below Limit of Quantification). Mean ± SEM.

Fig 2. Androgenicity expressed as Bioanalytical Equivalent concentration [BEQ] of Dihydrotestosterone (DHT); missing columns <LOQ. Mean ± SEM.

Fig 3 Estrogenicity expressed as Bioanalytical Equivalent concentration [BEQ] of 17β-estradiol (E2); missing columns <LOQ. Mean ± SEM.

Fig 4 Antagonistic effects on TR expressed as Bioanalytical Equivalent concentration [BEQ] of Diclazuril (DCZL); missing columns <LOQ. Mean ± SEM.

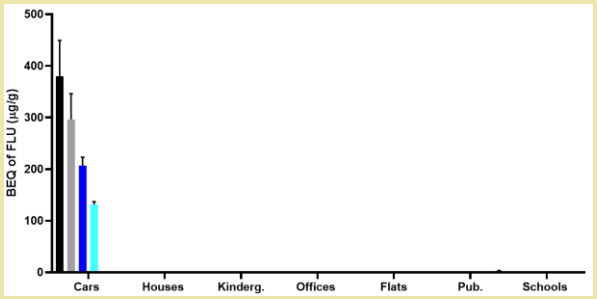


Fig 5 Antiandrogenicity expressed as Bioanalytical Equivalent concentration [BEQ] of Flutamide (FLU); missing columns <LOQ. Mean ± SEM.

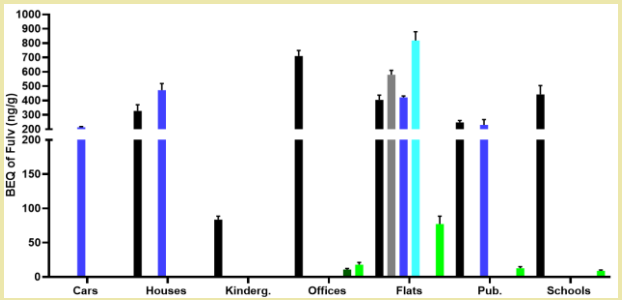


Fig 6 Antiestrogenic activity expressed as Bioanalytical Equivalent concentration [BEQ] of fulvestrant (ICI); missing columns <LOQ. Mean ± SEM.

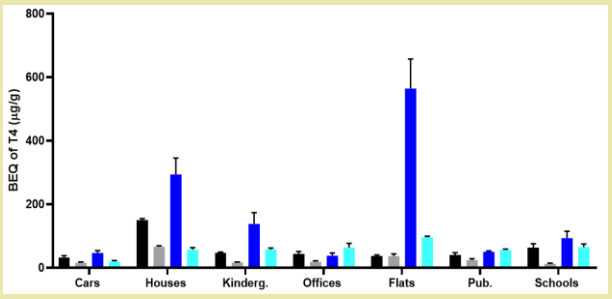


Fig 7 Displacement of T4 from TTR expressed as Bioanalytical Equivalent concentration [BEQ] of thyroxin (T4); missing columns <LOQ. Mean ± SEM.

CONCLUSION

- Extracts of dust from different microenvironments affected multiple modes of action of endocrine disruption
- Different effect patterns have been observed across the various types of indoor environment

REFERENCES

1- **Wannomai et al. (2020) DOI:** 10.1016/j.chemosphere.2020.1266322 -**Novotna et al. (2011)** DOI: 10.1021/es2029334; 3- **Wilson et al. (2002)** DOI: 10.1093/toxsci/66.1.69; 4 - **Ono (2012)**DOI: 10.1007/s11626-012-9500-5; 5- **Illés et al.(2015)** DOI: 10.1021/acs.jafc.5b01519

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