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Relative toxicity for indoor semi volatile organic compounds based on neuronal death

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Background: Semi Volatile Organic Compounds (SVOCs) are contaminants commonly found in dwellings as a result of their use as plasticizers, flame retardants, or pesticides in building materials and consumer products. Many SVOCs are suspected of being neurotoxic, based on mammal experimentation (impairment of locomotor activity, spatial learning/memory or behavioral changes), raising the question of cumulative risk assessment.

Aim: The aim of this work is to estimate the relative toxicity of such SVOCs, based on neuronal death.

Method: SVOCs fulfilling the following conditions were included: detection frequency >10% in dwellings, availability of data on effects or mechanism of action for neurotoxicity, and availability of dose-response relationships based on cell viability assays as a proxy of neuronal death. Benchmark concentration values (BMC) were estimated using a Hill model, and compared to assess relative toxicity.

Results: Of the 58 SVOCs selected, 28 were suspected of being neurotoxic in mammals, and 21 have been documented as inducing a decrease in cell viability *in vitro*. 13 have at least one dose-response relationship that can be used to derive a BMC based on a 10% fall in neuronal viability. Based on this *in vitro* endpoint, PCB-153 appeared to be the most toxic compound, having the lowest BMC₁₀ (0.072 µM) and diazinon the least toxic compound, having the highest BMC₁₀ (94.35 µM). We showed that experimental designs (in particular choice of cell lines) had a significant influence on BMC calculation.

Conclusion: For the first time, the relative *in vitro* toxicity of 13 indoor contaminants belonging to different chemical families has been assessed on the basis of neuronal cell viability. Lack of comparable toxicity datasets limits the number of SVOCs that can be included. More standardized protocols in terms of cell lines, species and exposure duration should be developed with a view to cumulative risk assessment.

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