Chiral signatures of PCB#s 95 and 149 in indoor air, grass, duplicate diets and human faeces

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Abstract

Chiral signatures of PCB#s 95 and 149 are reported for indoor air, grass, omnivorous and vegan duplicate human diet homogenates, and human faeces. Comparison of chiral signatures of both congeners in grass with those reported previously for outdoor air (measured at a height of 1.5 m) and soil at the same location suggest that volatilisation of PCBs present in soil may exert a significant influence on concentrations in grass. Duplicate diet homogenates display racemic signatures for both congeners. Alongside the racemic signatures in both outdoor and indoor air, this implies that human intake via diet and inhalation is racemic, and that the previously observed variation between individuals in the extent of enantioselective degradation in human liver samples indicates possible inter-individual variation in ability to metabolise PCBs. Chiral signatures of PCB# 95 in the 10 human faecal samples analysed indicate 8 to be racemic, but 2 to display an excess of the 2nd eluting enantiomer. This is consistent with the excess of the 1st eluting enantiomer reported elsewhere for human liver samples, as it implies enantioselective excretion of the 2nd eluting enantiomer. However, the racemic residues for PCB# 95 in the majority of faecal samples are a possible indication that enantioselective interaction of chiral PCBs with cytochrome P450 occurs slowly. The racemic or near-racemic signatures observed for PCB# 95 and 149 in indoor air match closely those in outdoor air, but differ from those in soil, adding to the weight of evidence that ventilation of indoor air is a far more significant contributor to outdoor air concentrations than volatilisation of PCBs from soil.

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1. Introduction

Polychlorinated biphenyls (PCBs) are organochlorine chemicals that found widespread use in a diverse range of applications, with around 1.2 million tonnes pro-

duced worldwide (Harrad et al., 1994). Owing to their toxicity, their production—but not their use—ceased throughout most of the industrialised world in the late 1970s. Although UK human exposure to PCBs has fallen in recent years in response to the cessation of their production in the late 1970s (Food Standards Agency, 2000, 2003), human health concerns remain—currently a substantial proportion of UK schoolchildren and toddlers are exposed at levels that exceed the UK government’s recommended tolerable daily intake to dioxins.