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The effect of co-occurring polychlorinated biphenyls on quantitation of toxaphene in fish tissue samples by gas chromatography negative ion mass spectrometry

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ABSTRACT

Determinative methods based on gas chromatography-negative chemical ionization mass spectrometry (GC–NCI/MS) provide improved sensitivity and specificity for toxaphene in environmental samples, but are subject to misidentification due to oxygen reaction in the presence of polychlorinated biphenyls (PCBs). The goal of this study was to quantify the impact of co-occurring PCBs in fish tissue samples when utilizing single quadrupole instruments to implement this method. Mixtures of PCB congeners and technical toxaphene, and extracts of fish tissue with varying concentrations of PCBs were analyzed for individual congener and total toxaphene concentrations by GC–NCI/MS. The contribution of co-injected PCB 204 ranged from 23 to 88% of the total peak area for the Cl-9 toxaphene homolog quantitation ion, a contribution that increased as the ratio of technical toxaphene to PCB 204 decreased. PCB interferences in fish tissue extracts, including a standard reference material, were subtracted using a three-step procedure featuring spectral analysis of isotopic patterns for target peaks. Total toxaphene concentrations without PCB subtraction in three fish tissue samples with low, intermediate and high co-occurring PCBs were overestimated by 33, 55 and 745%, respectively, underscoring the need for practical strategies to account for PCB interferences in GC–NCI/MS based protocols. In contrast, no appreciable interference or resulting positive bias in concentrations was observed for quantitation of eight common toxaphene residue congeners.

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