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Gas chromatography–mass spectrometry screening methods for select UV filters, synthetic musks, alkylphenols, an antimicrobial agent, and an insect repellent in fish

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Abstract:

Two screening methods have been developed for simultaneous determination of ten extensively used personal care products (PCPs) and two alkylphenol surfactants in fish. The methods consisted of extraction, clean-up, derivatization and analysis by gas chromatography–mass spectrometry with selected ion monitoring (GC–SIM–MS) or gas chromatography–tandem mass spectrometry (GC–MS/MS) techniques. Among solvents tested to assess recovery of target compounds from 1-g tissue homogenates, acetone was selected as optimal for extracting compounds with dissimilar physicochemical properties from fish tissue. Initial experiments confirmed that GC–SIM–MS could be applied for analysis of lean fillet tissue (<1% lipid) without gel-permeation chromatography (GPC), and this approach was applied to assess the presence of target analytes in fish filets collected from a regional effluent-dominated stream in Texas, USA. Benzophenone, galaxolide, tonalide, and triclosan were detected in 11 of 11 environmental samples at concentrations ranging from; 37 to 90, 234 to 970, 26 to 97, and 17 to 31 ng/g, respectively. However, performance of this analytical approach declined appreciably with increasing lipid content of analyzed tissues. Successful analysis of samples with increased lipid content was enabled by adding GPC to the sample preparation protocol and monitoring analytes with tandem mass spectrometry. Both analytical approaches were validated using fortified fillet tissue collected from locations expected to be minimally impacted by anthropogenic influences. Average analyte recoveries ranged from 87% to 114% with RSDs <11% and from 54% to 107% with RSDs <20% for fish tissue containing <1% and 4.9% lipid, respectively. Statistically derived method detection limits (MDLs) for GC–SIM–MS and GC–MS/MS methodologies ranged from 2.4 to 16 ng/g, and 5.1 to 397 ng/g, respectively.

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