Public Abstract
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Title:EVALUATION OF HUMAN TOENAIL AS A NON-INVASIVE BIOMONITORING MATRIX FOR ASSESSING HUMAN EXPOSURE TO ENVIRONMENTAL ORGANIC POLLUTANTS BY OPTIMIZED SAMPLE PREP AND GC/HRMS ANALYSIS

Human biomonitoring is a difficult challenge to find persistent pesticides, less persistent contaminants, and transient environmental pollutants in the non-invasive toenail matrix at very low, parts per billion (ppb) levels. Toenail clippings are compact, can be stored indefinitely at room temperature, processed without biohazard concerns, and grow over 2-3 months to potentially integrate chronic and pulsed episodic exposures. Toenail samples (65- 340 mg) from four individuals were ground by hand, digested with reagents, and extracted with a solvent. Lipid was removed and determined by a new small single-use flash column pressurized with high purity nitrogen to keep lab background as low as possible. Toenails averaged 1.22% lipid ± 0.20% for 10 samples. High performance columns were used with a very sensitive and expensive instrument called a GC/High Resolution Mass Spectrometer (GC/HRMS). Finding high chlordanes in toenails was surprising, because the metabolite oxychlordane was very low in toenail samples. Multiple toenail samples from one individual were collected over a year for replicate analysis. DDE averaged 0.82 ppb ± 0.28 and 65.2 ppb-lipid ± 15.3. Trans-nonachlor averaged 3.08 ppb ± 1.03 or 254 ppb-lipid ± 97. PBDE 28 averaged 24.8 ppb-lipid ± 13.3; PBDE 85, 20.8 ppb-lipid ± 6.2; and PBDE 153, 150 ppb-lipid ± 49.3, n=6. Most effectively biomonitored in toenails were normally transient triclosan (mean 58.3 ppb ± 6.6, n=2), chlordanes, DDT, brominated flame retardant PBDEs, and PCB congeners 52, 49, 44, 70, 95, 101, 87, and 110, which are suspect neurotoxins, but are rarely found by serum biomonitoring. Toenail soap washes indicated little (< 4%) or no exogenous contamination, except for two musk compounds in most samples, likely from topical application. Tentatively identified compounds included a UV Filter compound, octocrylene, and a hydroxyl-methyl benzothiazole.