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Arsenic and arsenic species in shellfish and finfish from the western Arabian Gulf and consumer health risk assessment

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This study reports the levels of total arsenic and arsenic species in marine biota such as clams (N=21) and pearl oyster (N=5) collected from nine costal sites in Jan 2014, and cuttlefish (N=8), shrimp (N=1), and seven commercially important finfish species (N=23) collected during Apr-May 2013 from seven offshore sites in the western Arabian Gulf. Total As and As species such as dimethylarsinic acid (DMA), arsenobetaine (AB), trimethylarsine oxide (TMAO), arsenocholine (AC), tetramethylarsonium ion (Tetra), arsenosugar-glycerol (As-Gly) and inorganic As (iAs) were determined by using ICPMS and HPLC/ICPMS. In bivalves, the total As concentrations ranged from 16 to 118 mg/kg dry mass; the toxic iAs fraction contributed on average less than 0.8% of the total As, while the nontoxic AB fraction formed around 58%. Total As concentrations for the remaining seafood (cuttlefish, shrimp and finfish) ranged from 11 to 134 mg/kg dry mass and the iAs and AB fractions contributed on average 0.03% and 81% respectively of the total As. There was no significant relationship between the tissue concentrations of total As and iAs in the samples. There was also no significant relationship between As levels in seafood and geographical location or salinity of the waters from which samples were collected. Based on our results, we recommend introducing a maximum permissible level of arsenic in Gulf seafood based on iAs content rather than based on total As. Our analyses of cancer risks and non-cancer hazards identified non-negligible risks and the potential for hazards; the greatest risks were identified for expatriate consumers of bivalves and high-end consumers of seafood. Despite this, many uncertainties remain that would be best addressed by further analyses.

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Screening of environmental contaminants in bees and hive matrices using a high resolution-mass spectrometry based approach

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Widespread in the environment of POPs (persistent organic pollutants) is a combination of resistance to breakdown reactions, lipophilicity, propensity to accumulate as well as tendency to enter the gas phase under environmental temperatures and susceptible to long-range transport and deposition. Most volatile and lipophilic contaminants may be deposited onto vegetation surfaces or blended with plant parts rich in lipids, for instance, pollen grains. Detection of environmental contaminants is extremely challenging, because of the large and continually increasing number of chemicals, but fundamentally due to the need for developing screening strategies for monitoring contaminants. A limitation of gas chromatography –mass spectrometry (GC-MS) based methods for target monitoring of chemicals is that several other key environmental contaminants are out of reach. Residues of veterinary treatments applied in apiculture and other pesticide residues are typically analyzed using multiplexed methods involving gas or liquid chromatography coupled to triple-quadrupole (QqQ) mass spectrometers operated in the multiple reaction monitoring mode (MRM). The benefits of high resolution mass spectrometry systems in screening capabilities, enabling retrospective analyses for the detection of non-preselected molecules, has been rarely explored in relation to monitoring of apiaries. The analytical approach presented in this study, by using gas chromatography full spectra acquisition by high resolution time-of-flight mass spectrometry (GC-TOF-MS), is primarily intended to be used for characterization the organic pollution pattern, when no prior information is available, and especially for lipophilic matrices such as bee wax comb suspected to be contaminated with GC amenable environmental contaminants.

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