Micro and nano plastics in seafood: are plastic associated contaminants viable markers?

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Microplastics pose a risk to marine life and it has been suggested, since fishery and aquaculture provide a considerable fraction of the world's food supply[1], that they may further threat food security and food safety. As very recently reviewed[2], even if there are several research papers dealing with the effects of microplastics onto marine organisms, evidences related with the impact on food supply are lacking. Peer reviewed data suggests that microplastics do not biomagnify, thus the organisms at the lower trophic levels are considered at greater risk of microplastic contamination, containing more microplastic per gram body. On the other hand, the organism on the top of the food chain may suffer from increased transfer of plastic associated contaminants and an induced lack of feed. Moreover, in the recent years the question concerning the translocation of the smaller particles (nanoplastics, 1-1000 nm) trough different tissues has emerged, but current analytical methods developed for microplastics have a particle size limitation and cannot reach the submicrometer range. Starting from this basis, in this work we examined the presence of plastic tracers in seafood (wild caught fish, aquaculture fish, crabs, mussels, sea urichin and shrimps) detected by SPME extraction(Figure 1) and LC-MS/MS analysis[3] and the presence of microplastics detected trough micro-spectroscopy and thermal mass spectrometry approaches[4]. Results and emerged correlation are here discussed.

[1] FAO, 2018. The State of World Fisheries and Aquaculture Meeting the Sustainable Development Goals. Food and Agriculture Organization of the United Nations
[2] C. Walkinshawa,, P. K. Lindeque, R. Thompson, T. Tolhurst, M. Cole. Microplastics and seafood: lower trophic organisms at highest risk 0f contamination Ecotoxicology and Environmental Safety 190 (2020) 110066
[3] A. Panio , S. Fabbri Corsarini , A. Bruno , M. Lasagni, M. Labra, F. Saliu. Determination of phthalates in fish fillets by liquid chromatography tandem mass spectrometry (LC-MS/MS): A comparison of direct immersion solid phase microextraction (SPME) versus ultrasonic assisted solvent extraction (UASE)
[4] J. La Nasa, G. Biale, D. Fabbri, F. Modugno A review on challenges and developments of analytical pyrolysis and other thermoanalytical techniques for the quali-quantitative determination of microplastics, 149, (2020) 104841

Abstract

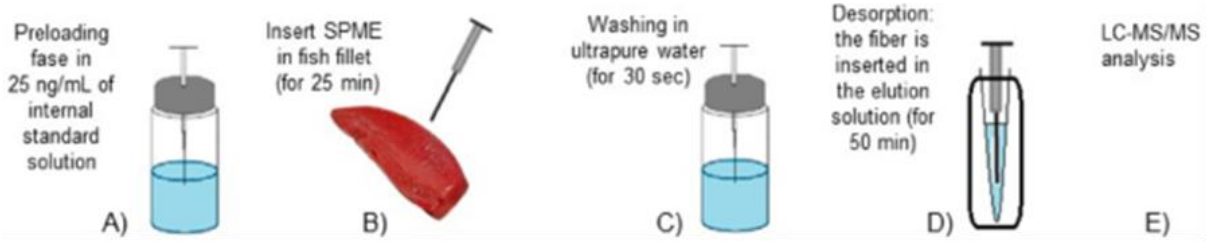

Figure 1: microextraction of plastic associated contaminants from fish fillet by using biocompatible solid phase device