The influence of microplastics and halogenated contaminants in feed on toxicokinetics and gene expression in European seabass (Dicentrarchus labrax)

When microplastics pollute fish habitats, it may be ingested by fish, thereby contaminating fish with sorbed contaminants. The present study investigates how combinations of halogenated contaminants and microplastics associated with feed are able to alter toxicokinetics in European seabass and affect the fish. Microplastic particles (2%) were added to the feed either with sorbed contaminants or as a mixture of clean microplastics and chemical contaminants, and compared to feed containing contaminants without microplastics. For the contaminated microplastic diet, the accumulation of polychlorinated biphenyls (PCBs) and brominated flame retardants (BFRs) in fish was significantly higher, increasing up to 40 days of accumulation and then reversing to values comparable to the other diets at the end of accumulation. The significant gene expression results of liver (cyp1a, il1β, gstα) after 40 days of exposure indicate that microplastics might indeed exacerbate the toxic effects (liver metabolism, immune system, oxidative stress) of some chemical contaminants sorbed to microplastics. Seabass quickly metabolised BDE99 to BDE47 by debromination, probably mediated by deiodinase enzymes, and unlike other contaminants, this metabolism was unaffected by the presence of microplastics. For the other PCBs and BFRs, the elimination coefficients were significantly lower in fish fed the diet with contaminants sorbed to microplastic compared to the other diets. The results indicate that microplastics affects liver detoxification and lipid distribution, both of which affect the concentration of contaminants.

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