

Responses of the European flounder (*Platichthys flesus*) to a mixture of PAHs and PCBs in experimental conditions

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Abstract A multibiomarker approach was developed to evaluate the juvenile European flounder responses to a complex mixture of 9 polycyclic aromatic hydrocarbons (PAHs) and 12 polychlorinated biphenyls (PCBs). Exposure was performed through contaminated food pellets displaying: (1) PAH and PCB levels similar to those detected in the heavily polluted Seine estuary, respectively in sediments and in flatfish and (2) ten times these concentrations. Several biomarkers of the immune system (e.g., lysozyme concentration and gene expression of complement component C3 and TNF-receptor), DNA damage (e.g., Comet assay), energetic metabolism (e.g., activity of cytochrome C oxidase), detoxification process

(e.g., cytochrome P450 1A1 expression level: CYP1A1; betaine homocysteine methyl transferase expression level: BHMT) were investigated after 14 and 29 days of contamination, followed by a 14-days recovery period. After 29 days of contamination, the detoxification activity (CYP1A1 expression level) was positively correlated with DNA damages; the increase of the BHMT expression level could also be related to the detoxification process. Furthermore, after the recovery period, some biomarkers were still upregulated (i.e., CYP1A1 and BHMT expression levels). The immune system was significantly modulated by the chemical stress at the two concentration levels, and the lysozyme appeared to be the most sensitive marker of the mixture impact.

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