Efficient electrophile detoxification in bivalve gills: CDNB as a model compound.

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Our group recently found a differentially expressed P₄₅₀-related gene in oyster exposed to sewage and in the present work we characterize phase-2 (conjugation reactions) and suggest an efficient phase-3 (export) of detoxification in the oyster Crassostrea gigas exposed in vivo to 10 μM chlorodinitrobenzene (CDNB). The kinetics of CDNB and its metabolites were followed in gills, digestive gland, haemolymph and seawater, as well as the levels of thiols and the activity of antioxidant enzymes. CDNB is eliminated from seawater in about 6h (t₁/₂ 1.2 (0.9-1.8) h) and build-up rapidly (4h) in the haemolymph, which was followed by GSH-CDNB conjugate (phase-2) accumulation (4h) and elimination (4-24 h) from the haemolymph, gills and digestive gland. Conjugated CDNB in tissues reached the lowest values after 24 h of exposition, suggesting further metabolism and elimination. At 4-7 h it is already possibly to detect metabolites in the seawater, reaching a plateau around 18 h of exposition, indication an efficient gills-export system (phase-3). Gill glutathione (GSH), glutathione reductase and thioredoxin reductase decreased progressively up to 24 h, while digestive gland counterparts remained unchanged. These data indicate a prominent function of gills in phase-2 detoxification as compared to the digestive gland. Summing up, our results suggest that CDNB enter rapidly oyster tissues, is rapidly conjugated, and followed by further metabolization and elimination to the seawater. This is the first description of a global in vivo picture of phase-2 (conjugation) and of phase 3 (elimination) reactions in bivalves.

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