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Trophic transfer and effects of DDT in male hornyhead turbot (*Pleuronichthys verticalis)* from Palos Verdes Superfund site, CA (USA) and comparisons to field monitoring

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ABSTRACT

High concentrations of DDT and metabolites (ΣDDT) have been detected in sediment and the demersal flatfish hornyhead turbot (*Pleuronichtys verticalis*) collected from Palos Verdes (PV), California, USA, a site contaminated with over 100 metric tons of DDT throughout 1960–70s. This study was conducted to assess the transfer of ΣDDT from PV-sediment into polychaetes (*Neanthes arenaceodentata*) and hornyhead turbot, and to investigate if the responses in turbots from two different laboratory exposures mimic those in turbots caught in PV (PV-turbot). Turbot fed PV-sediment-contaminated polychaete for 7 days had liver concentrations of ΣDDT similar to PV-turbot. After 28 days, ΣDDT also accumulated in livers of turbot gavaged with a ΣDDT mixture. *In vitro* cell bioassays indicated significant increases of 17bestradiol equivalents (EEQ) in turbot bile extracts as compared to the control in the 7-day study. These responses corresponded to those measured in PV-fish. Glucocorticoid receptor (GR), anti-androgen receptor (anti-AR), estrogen receptor (ER) or aryl hydrocarbon receptor (AhR) activities were also observed in extracts of PV-sediment, and PV-sediment-exposed worm. Anti-AR, AhR and GR activities were significantly higher in PV-sediment than reference sediment (San Diego, SD). Higher transcripts of hepatic VTG, ERα and ERβ were found in PV-turbot than SD-turbot, but were unaltered in fish exposed to sediment-contaminated worms for the 7-day study. In contrast, liver extracts from the 28-day treatment of ΣDDT showed lower EEQ but similar hepatic VTG and ERβ transcripts relative to those of PV-turbot. These data indicated that trophic transfer of sediment-associated DDT in 7-day exposures corresponded to field measurements of DDT residues and *in vitro* ER bioactivities, but failed to mimic *in vivo* biological effects observed in field fish. In contrast, treatment with ΣDDT alone for 28 days mimicked *in vivo* biological effects of DDTs in PV fish, but did not correspond to liver concentrations or *in vitro* bioactivities.