

Matsuo, A.Y.O., Woodin, B.R., Reddy, C.M., Val, A.L., and Stegeman, J.J. , *Humic substances and crude oil induce cytochrome P450 1A expression in the Amazonian fish species Colossoma macropomum (Tambaqui)*, Environ. Sci. Technol., , 2006; v40, pp.2851-2858.

Cytochrome P450 1A (CYP1A) induction is used widely as a biomarker of exposure to pollutants, such as petroleum hydrocarbons, yet CYP1A inducibility has been characterized in few tropical fish. Using Western blot analysis, catalytic assay, and immunohistochemistry, we evaluated CYP1A induction in an Amazonian fish (tambaqui; *Colossoma macropomum*) acclimated to humic substances (HS) and acutely exposed to crude oil. HS are ubiquitous in Amazonian waters, and they are known to affect the bioavailability of pollutants. CYP1A activity was also measured in fish exposed for 10 days to a range of concentrations of HS from both natural and commercial sources. Crude oil induced CYP1A expression in tambaqui, as expected. Exposure to both HS and crude oil resulted in greater levels of CYP1A expression relative to that in fish exposed to petroleum alone. Interestingly, CYP1A induction was also observed in fish exposed to HS alone. Induction by HS was concentration-dependent, and activity was higher in fish exposed to HS from the commercial source than in fish exposed to the HS from the natural source. The use of CYP1A as a biomarker of exposure to pollutants such as petroleum hydrocarbons in fish living in environments rich in humic substances should be considered with caution given that HS themselves induce CYP1A expression. Our results suggest that there may be as yet unknown CYP1A inducing components (aryl hydrocarbon receptor agonists) in humic substances.