Pastorok RA, Peek DC, Sampson JR, Jacobson MA. Ecological risk assessment for river sediments contaminated by creosote. *Environmental Toxicology and Chemistry* 13.12 (1994): 1929-1941. (Reviewed by Lucy Cho)

The presence of a wood-preserving facility, specifically the McCormick & Baxter Creosoting Company in Portland, OR, has raised concerns about the contamination of the Willamette River by creosote deposits. Creosote is a chemical used for the protection or preservation of wood. Indeed, levels of creosote were detected within approximately 300 feet of the shoreline, and high toxicity levels were detected near a dock where creosote is dumped into the river. The company site is downstream of the Swan Island industrial area, but upstream of the St. Johns Bridge. The wood-treating products used historically in this site include creosote/oil mixtures, pentachlorophenol/oil mixtures and various water-based solutions containing arsenic, chromium, copper and zinc. Along with creosote, other contaminants were found such as polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and metals.

The focus was on sediment conditions and the effect of contamination on the wildlife, especially on benthic species such as crayfish and large-scale suckers, who live in direct contact with the sediment, and would therefore best reflect the effects of the creosote contamination. The biological effects were assessed in these animals by measuring creosote concentration in the muscle tissue of crayfish, and the livers of the sucker fish were examined for serious lesions. These observations suggested that chronic exposure to creosote in the sediment along most of the main channel of the river poses a relatively small risk to these animals largely due to their mobility, although crayfish which have a more limited mobility than fish have a higher potential for acute toxic exposures.

Critique

This ecological risk assessment was organized into four basic steps including problem formulation, exposure assessment, ecological effects assessment, and risk characterization. This organization allowed for a clear and complete study of the ecological and biological effects of the creosote contamination on the wildlife of the river. What was good about this approach was that the last step, risk characterization, integrated the exposure and ecological effects assessments along with evaluations of underlying assumptions and uncertainties.

The uncertainty analysis was particularly useful in revealing the potential flaws in their research, and for proposing other possible studies that were either too time-consuming or expensive for this team. For example, it was acknowledged that studying the histopathology of a single species of fish, which in this case was the large-scale sucker, could not be wholly representative of the ecological hazard. Another potential flaw in their work would be that they did site-specific analyses, which can limit bioavailability and toxicity of chemicals, meaning that levels of contaminants measured in a certain site may not accurately predict a hazard. While these flaws and others exist in this study, the presentation of them could allow other future studies to move forward with improvements.

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