

Assessment of Bio available Polycyclic Aromatic Hydrocarbons and Induction of Erythrocytic Nuclear Abnormalities Associated with Petroleum Refinery Wastewater Exposure Using Fish Models

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Petroleum refinery wastewater may contain different chemicals including polycyclic aromatic hydrocarbons (PAHs) some of which are genotoxic. Release of the refinery wastewater to the aquatic environments may pose a threat to the aquatic fauna especially fish populations. Biological effects associated with wastewater can be assessed using biomarkers as early warning signals. The objective of the present study was to assess biological effects associated with wastewaters of Petroleum Refinery, Sri Lanka using a selected PAH indicative biomarker (bile fluorescent PAH metabolite patterns) and a genotoxic biomarker (erythrocytic micronuclei in the blood) using fish models. The fish species used in the study were *Oreochromis niloticus* for controlled laboratory exposure and *Trichogaster pectoralis* and *Puntius filamentosus*, inhabiting water canals located near the Petroleum refinery (Pattiwila canal and Heiyanthuduwa canal) for exposure assessments under natural conditions. A less polluted water body was selected as the control site for field studies (Bathalagoda reservoir). Bile fluorescence patterns of the fish were assessed using fixed fluorescence and synchronous fluorescence spectrometry. Erythrocytic nuclear abnormalities in the blood (micronuclei, binuclei and other nuclear abnormalities) were examined using cytogenetic tests. The results showed that several PAHs metabolites (Naphthalene-, Phenanthrene-, Fluoranthene-, Chrysene- and Benzo(a)pyrene-type) accumulate in bile of *O. niloticus* as a result of being exposed to the Petroleum refinery wastewater under laboratory conditions. Bile of *T. pectoralis* and *P. filamentosus* collected from the nearby canals also displayed PAH exposure in comparison to the fish collected from the control site. Erythrocytic micronuclei in the blood were highly induced in the fish species examined under laboratory (upto 20 fold) and field conditions (upto 26 folds) in comparison to the comparable controls. The present study revealed that tested petroleum refinery wastewater contains micronuclei inducible contaminants including PAHs.