

Occurrence of selected estrogenic compounds and estrogenic activity in surface water and sediment of Langat River (Malaysia)

ABSTRACT

The occurrence and estrogenic activities of steroid estrogens, such as the natural estrone (E1), 17 β estradiol (E2), and estriol (E3), as well as the synthetic 17 α -ethynylestradiol (EE2), were investigated in eight sampling points along the Langat River (Malaysia). Surface water samples were collected at 0.5 m and surface sediment 0–5 cm from the river surface. Instrument analysis of steroid estrogens was determined by UPLC-ESI-MS with an ultra-performance liquid chromatograph (Perkin Elmer FX15) coupled to a Q Trap function mass spectrophotometer (model 3200: AB Sciex). Steroid estrogen concentrations were higher in the Langat River sediments than those in its surface water. In surface water, E1 was not detected in any sampling point, E2 was only detected in two midstream sampling points (range 0–0.004 ng/L), E3 in three sampling points (range 0–0.002 ng/L), and EE2 in four sampling points (range 0–0.02 ng/L). E1 and E2 were detected in sediments from all sampling points, E3 in five sampling points, while EE2 only in one midstream sample (3.29E–4 ng/g). Sewage treatment plants, farming waste, and agricultural activities particularly present midstream and downstream were identified as potential sources of estrogens. Estrogenic activity expressed as estradiol equivalents (EEQs) was below 1 ng/L in all samples for both surface water and sediment, indicating therefore a low potential estrogenic risk to the aquatic environment. Although the health risks are still uncertain for drinking water consumers exposed to low levels of steroid estrogen concentrations, Langat River water is unacceptable for direct drinking purposes without treatment. Further studies of endocrine disruptors in Malaysian waters are highly recommended.

Keyword: Occurrence; Steroid estrogen; Estrogenic activity; Langat River