**Mathematical modeling for estrogenic activity prediction of 17βestradiol and 17α-ethynylestradiol mixtures in wastewater treatment plants effluent**

ABSTRACT

Steroid estrogens such as 17β-Estradiol (E2) and 17α-Ethynylestradiol (EE2) are highly potent estrogens that widely detected in environmental samples. Mathematical modelling such as concentration addition (CA) and estradiol equivalent concentration (EEQ) models are usually associated with measuring techniques to assess risk, predict the mixture response and evaluate the estrogenic activity of mixture. Wastewater has played a crucial role because wastewater treatment plant (WWTP) is the major sources of estrogenic activity in aquatic environment. The aims of this is to determine E2 and EE2 concentrations in six WWTPs effluent, to predict the estrogenic activity of the WWTPs effluent using CA and EEQ models where lastly the effectiveness of two models is evaluated. Results showed that all the six WWTPs effluent had relative high E2 concentration (35.1–85.2 ng/L) compared to EE2 (0.02–1.0 ng/L). The estrogenic activity predicted by CA model was similar among the six WWTPs (105.4 ng/L), due to the similarity of individual dose potency ratio calculated by respective WWTPs. The predicted total EEQ was ranged from 35.1 EEQ-ng/L to 85.3 EEQ-ng/L, explained by high E2 concentration in WWTPs effluent and E2 EEF value that standardized to 1.0 μg/L. The CA model is more effective than EEQ model in estrogenic activity prediction because EEQ model used less data and causes disassociation from the predicted behavior. Although both models predicted relative high estrogenic activity in WWTPs effluent, dilution effects in receiving river may lower the estrogenic response to aquatic inhabitants.

**Keyword:** Mathematical modelling; 17β-estradiol; 17αethinylestradiol; Wastewater; Effluent; Estrogenic activity