



Prediction and optimization of steroid hormone removal parameters from municipal wastewater by ultrasound probe using artificial neural network and genetic algorithm: a review

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Received 29 December 2021; Accepted 5 August 2022

ABSTRACT

Estrogens are one of the micropollutants in the wastewater which are harmful to the aquatic. Because the biological processes in wastewater treatment plants cannot completely remove micropollutants, these compounds are present in wastewater effluents. Therefore, we need a treatment method to remove the hormones from the wastewater. Ultrasound waves are very effective to eliminate the micropollutants. This study is based on an analysis of publications published since 2000. Here, ultrasound-assisted research on the removal of hormones (estrone (E_1) and 17β -estradiol (E_2)) from wastewater were studied, then data was collected from existing papers and the model was applied to them. Hormone removal from the wastewater by ultrasound-assisted was modeled and optimized using a multilayer artificial neural network coupled with a genetic algorithm. A network was designed in multilayer perceptron. Various training algorithms were evaluated, and the Levenberg–Marquardt (LM) algorithm was selected as the best one. The optimal number of neurons in the hidden layer was 12, according to the maximum correlation coefficient (R), the lowest absolute mean error, the lowest mean bias error, and the minimum mean square error. According to the results of genetic algorithm, the optimum performance conditions were determined, and the results showed that increasing pH and power density, increased the efficiency of hormone removal from the wastewater. Finally, sensitivity analysis was performed by the Spearman method.

Keywords: Hormones removal; Ultrasound; Wastewater; Artificial neural network; Genetic algorithm

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