

Transformation of Iopromide Due to Redox Gradients in Sediments of the Hyporheic Zone

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Abstract : Recalcitrant pharmaceuticals are increasingly found in urban water systems forced by demographic changes. The groundwater-surface water interface, or the hyporheic zone, is known for its impressive self-purification capacity of water bodies. Redox gradients present in this zone provide a wide range of electron acceptors and harbour diverse microbial communities. Biotic transformations of pharmaceuticals in this zone have been demonstrated, but not much information is available on the kind of communities bringing about these transformations. Therefore, bioreactors using sediment from the hyporheic zone of a river in Berlin were set up and fed with iopromide, a recalcitrant iodinated X-ray contrast medium. Iopromide, whose many oxic and anoxic transformation products have been characterized, was shown to be transformed in such a bioreactor as it passes along the gradient. Many deiodinated transformation products of iopromide could be identified at the outlet of the reactor. In our experiments, it was seen that at the same depths of the column, the transformation of iopromide increased over time. This could be an indication of the microbial communities in the sediment adapting to iopromide. The hyporheic zone, with its varying redox conditions, mainly due to the upwelling and downwelling of surface and groundwater levels, could potentially provide microorganisms with conditions for the complete transformation of recalcitrant pharmaceuticals.

Keywords : iopromide, hyporheic zone, recalcitrant pharmaceutical, redox gradients

Conference Title : ICEBB 2020 : International Conference on Environmental Biotechnology and Bioremediation

Conference Location : Zurich, Switzerland

Conference Dates : January 13-14, 2020