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Biotransformation of trace organic chemicals in the presence of highly refractory dissolved organic carbon

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1 **Biotransformation of trace organic chemicals in the presence of highly**  
2 **refractory dissolved organic carbon**

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9  
10 **Abstract**

11 Previous studies demonstrated that the transformation of trace organic chemicals (TOrcs) in  
12 managed aquifer recharge (MAR) systems is favored under carbon-limited and oxic redox  
13 conditions especially, if the dissolved organic carbon (DOC) serving as primary substrate has  
14 a refractory character. Since co-metabolism is suggested to be the dominant removal  
15 mechanism, it is hypothesized that TOrcs transformation is controlled by the concentration of  
16 the refractory carbon under oxic redox conditions. A laboratory-scale soil column experiment  
17 mimicking MAR was established to investigate the influence of two different concentrations  
18 of highly refractory carbon sources on TOrcs transformation, namely drinking water (DW)  
19 and drinking water augmented with humic acid (DW+HA). Oxic redox conditions and carbon-  
20 limitation were present in both systems ( $\Delta\text{DOC}_{\text{DW+HA}} \approx 0.6 - 0.7 \text{ mg/L}$ ;  $\Delta\text{DOC}_{\text{DW}} \approx 0.1 \text{ mg/L}$ ).  
21 Of the 12 TOrcs investigated seven exhibited moderate to efficient transformation in both  
22 systems with only one compound (diclofenac) showing significantly enhanced (co-metabolic)  
23 biotransformation by adding humic acids as primary growth substrate. It is postulated that  
24 transformation of some TOrcs is characterized by metabolic degradation under starving

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