Using a Novel Photoelectrochemical Oxygen Demand (peCOD) Analyzer to Estimate Concentrations of Venlafaxine in Freshwater

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Detection of contaminants in the environment is a primary concern in remediation and monitoring efforts. Photoelectrochemical oxygen demand (peCOD) is an analysis technique which may provide utility in detection of organic contaminants in aquatic systems. Venlafaxine is a prescribed antidepressant that is transported into the environment in wastewater. In an experiment to assess the fate and toxicity of venlafaxine in aquatic ecosystems, 10 mesocosms were deployed in Lake 239 at the IISD-Experimental Lakes Area (IISD-ELA). A regression design was employed with target concentrations ranging from 100 000 $ng \cdot L^{-1}$ to 4.18 $ng \cdot L^{-1}$ with three control mesocosms. A peCOD analyzer was paired with this experiment to assess its efficacy at determining accurate estimates of venlafaxine concentrations in the higher concentration treatments. Water for venlafaxine analysis was analyzed by ultra-high performance liquid chromatography mass spectrometry (UHPLC-MS), while subsamples were analyzed for peCOD. Sampling occurred 12, 24, 48, 96, and 168 hours post-treatment. There were correlations between peCOD analysis in the two highest treatments (100 000 $ng \cdot L^{-1}$, 19 306 $ng \cdot L^{-1}$) and the UHPLC-MS results. Considering the high background DOC in the sample (8.0 $\pm$ 1.0 mg/L), these preliminary findings warrant further investigation into use of peCOD as a technique for assessing high concentrations of organic analytes in boreal water matrices. While the ability for qualitative determination of organic analytes through peCOD is still being investigated, quantitative determination of organics in aquatic samples appears to be possible in appropriate conditions.