CR0380: HPLC-DAD-MS-MS MONITORING OF VETERINARY PHARMACEUTICALS IN WATER AFTER DEGRADATION BY FENTON PROCESS AND TOXICOLOGICAL EVALUATION

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Abstract Text:
Pharmaceuticals, both in their parent form and as metabolites, are commonly released into the environment at trace levels through conventional sewage treatment plants. Another source of entry of pharmaceuticals in the aquatic environment is a result of its veterinary use, mainly in aquaculture practices. Pharmaceuticals have been detected in ground, surface, drinking, tap and ocean water. Pharmaceuticals released in the environment may impose toxicity on any level of the biological hierarchy. In addition to toxic effects, certain classes of pharmaceuticals may cause long-term and irreversible change to the micro-organisms genome, making them resistant in their presence, even at low concentrations. It is therefore important to develop efficient treatment methodologies for limiting the presence of pharmaceuticals contaminants in aquatic environments. Presence of residual pharmaceuticals in the environment and especially in aquatic systems in particular represents a serious environmental problem as these compounds could be resistant to biological degradation processes and usually escape intact from conventional treatment plants, may impose serious toxic and other effects to humans and other living organisms. Since such compounds have been found to be present at minute concentrations, more sophisticated and laborious analytical tools for their accurate determination are required. Therefore, it is not surprising that research has recently been directed towards the application of non-biological processes for the destruction of pharmaceuticals in water systems with the emphasis on advanced oxidation processes (AOPs). [1, 2]

This work has tackled degradation of fluoroquinolone antibiotic ciprofloxacin, glucocorticosteroid dexamethasone, anthelmintic febantel, sulfonamide antibiotic sulfamethoxazole and their synergist trimethoprim in water by Fenton process at lab scale. Aqueous solutions of pharmaceuticals were prepared by dissolving of appropriate amount of investigated compounds in double deionised water at an initial concentration of 1 and 10 mg/L. After 30 minutes of Fenton process samples of reaction mixture were subjected to TOC and HPLC-DAD analysis in order to determine mineralization i.e. removal extent of particular pharmaceutical. Furthermore, identification of the intermediate products generated during the
process were performed using the liquid chromatography coupled to mass spectrometry (HPLC-ESI(+)-MS-MS). Chromatographic conditions include gradient separation with 0.01% formic acid in water and 0.01% formic acid in acetonitrile at 30 oC on Synergi 4 µ Fusion-RP 80 Å column (150x2.0 mm for HPLC-MS-MS and 150x4.6 mm for HPLC-DAD).

The evaluation of toxicity by measuring the bioluminescence inhibition of Vibrio fischeri bioassays during the Fenton process was also performed.

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References: