SPE-HPLC/DAD determination of trimethoprim, oxytetracycline and enrofloxacin in water samples before and after RO/NF membrane treatment

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The occurrence of veterinary and other pharmaceuticals in environment has led in the last ten years to increased research space in analysis of pollutants in surface water and sediments. As possible environmental threats of these compounds are still not well known, every information on pharmaceutical presence in water is of environmental relevance. Of all the emerging contaminants human or veterinary antibiotics are the biggest concern since their environmental emissions can increase the occurrence of resistant bacteria in the environment, which can lead to unforeseen consequences. One of the major sources of these compounds are industrial process wastewaters. To unburden surface recipients from pharmaceutical active compounds, their removal is recommended. As conventional water treatment processes are ineffective in the removal of emerging contaminants, methods such as carbon adsorption, advanced oxidation processes and modern pressure driven membrane processes nanofiltration and reverse osmosis (NF/RO) should be used for this purpose. This work focused on the SPE–HPLC-DAD analysis method development of veterinary pharmaceuticals of three different classes in highly complex wastewater matrices and their removal by NF/RO membrane separation processes. The pharmaceuticals investigated include sulfonamide synergist trimethoprim, oxytetracycline, and fluoroquinolone enrofloxacin. The analytical method involves pre-concentration and clean-up by solid phase extraction (SPE) on polystyrenedivinylbenzene Varian Empore extraction disks and determination by high-performance liquid chromatography (HPLC) on Varian ProStar500 HPLC/DAD with Varian RP-18 column. Detection and quantification was performed at 254 nm. The best separations were achieved with mobile phase 0.5 % formic acid and 1 % trifluoroacetic acid in 0.05 M ammonium acetate-methanol, 70+30, (v/v). The removal of above mentioned pharmaceuticals from wastewaters was investigated by NF/RO membranes. The analytical results on pharmaceuticals in permeate streams showed complete rejection of all by tight NF membranes and RO membranes.

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