Determination of Hormones in Wastewater Using Rotating Disk Sorptive Extraction and Gas Chromatography-Mass Spectrometry

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Resumen

A simple and green analytical method based on the use of rotating disk sorptive extraction is reported for the simultaneous determination of hormones in wastewater. The analytes were 17-estradiol, estriol, and 17 alpha-ethinylestradiol. The analytes were separated and preconcentrated by rotating disk sorptive extraction and derivatized with N-methyl-N-(trimethylsilyl)trifluoroacetamide for determination by gas chromatography-mass spectrometry using (20,21)-C-13(2)-17 alpha-ethinylestradiol as a surrogate standard. Typical phases used in solid phase extraction of estrogenic hormones (C18 and divinylbenzene-N-vinylpyrrolidone copolymer) were tested in the rotating disk sorptive extraction, and a significantly higher recovery was obtained using divinylbenzene-N-vinylpyrrolidone copolymer. The optimum extraction conditions were a sample volume of 25 mL, a disk rotation velocity of 3000 rpm, an extraction time of 60 min, and a desorption time of 15 min using two portions of 4.5 mL methanol. Under these conditions, recoveries from 78 to 107% and 83 to 95% were obtained from the influent and effluent of wastewater treatment plants with relative standard deviations less than 8%. The method detection limits were between 5 and 39 ng L-1 depending on the analyte. The influent and effluent from wastewater treatment plants were analyzed, and the most polar compound, estriol, was found in influent at a concentration of 1.2 mu g L-1. An eco-scale was employed to assess the greenness of the method; the results showed that rotating disk sorptive extraction may be classified as a green methodology.

Palabras clave

Palabras clave de autor: Green method; hormones; rotating disk sorptive extraction; wastewater
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