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Green Analysis of Steroids for Clinical Purposes: The Use Of Ethanol as an Environmentally Friendly Alternative for Solid-Phase Extraction

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Abstract

The paper describes the use of a "green" automated on-line solid phase extraction (SPE) coupled to liquid chromatography and tandem mass spectrometry (LC–MS/MS) for the analysis of androstenedione and testosterone in human serum. The on-line SPE was performed using aqueous ethanol for cleanup and analyte extraction instead of aqueous acetonitrile. To evaluate the accuracy of the proposed method, a range of samples were extracted using aqueous ethanol and the results were compared with the traditional method with acetonitrile. Results showed good agreement between extraction, however, on-line SPE with ethanol provides more environmentally friendly alternative by reducing hazardous waste and potential environmental pollution. Ethanol has better EHS (environmental, health and safety) properties than acetonitrile, such biodegradability and it is considered to be a "bio-solvent", i.e. produced with renewable resources (by fermentation processes). Therefore, its manipulation is less harmful for analysts. The strategy showed to be possible allied efficiency, safety and high quality with cleaner production practices.

Keywords: *cleaner production, ethanol, steroids, green solid-phase extraction, LC-MS/MS.*