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Detection of hydroxyethylstarch and dextran by UHPLC-orbitrap high resolution mass spectrometry

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Abstract

Plasma volume expanders (PVEs) such as hydroxyethyl starch (HES) and dextran are misused in sports because they can prevent dehydration and reduce hematocrit values to mask erythropoietin abuse. Endogenous hydrolysis generated multiple HES and dextran oligosaccharides which are excreted in urine. Amount and composition of the urinary metabolic profiles of PVEs varies depending on post-administration time and can have an impact on their detectability.
In this work, a “dilute-and-shoot” method for the detection of HES and dextran in human urine by ultra-high-pressure liquid chromatography-electrospray ionization-high resolution Orbitrap™ mass spectrometry was developed to investigate urinary excretion profiles of HES and dextran. Different data acquisition modes (full scan with and without in-source collision-induced dissociation) were used. In-source fragmentation yielded the best results in terms of LOD and detection times, whereas detection of HES and dextran metabolites in full scan mode with no in-source fragmentation is related to recent administration (< 24 hours). Urinary excretion studies showed detection windows for HES and dextran respectively of 72 and 48 hours after administration.
Validation of the method showed a LOD in the range of 10-500 µg/mL for the most significant HES and dextran metabolites in the different modes. The method allows retrospective data analysis and can be implemented in existing doping control screening analysis.

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