Chiral Analysis of Amphetamines in Hair by Liquid Chromatography-Tandem Mass Spectrometry: Compliance-Monitoring of attention deficit hyperactivity disorder (ADHD) patients under Elvanse® therapy and identification after controlled low dose application.

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Abstract

Amphetamine (AMP) is used as an illicit drug but also for the treatment of attention deficit hyperactivity disorder (ADHD). Respective drugs most often contain the enantiomer (S)-AMP as active compound or (S)-AMP is formed from the prodrug lisdexamfetamine (Elvanse®) whereas the illicit drug is usually traded as a racemate ((R/S)-AMP). A differentiation between the use of the medically prescribed drug and the abuse of illicit street amphetamine is of great importance e.g. in retrospective consumption monitoring by hair analysis. An LC-MS/MS method for the chiral separation and quantitation of (S)- and (R)-AMP in hair was developed. For this purpose, 20 mg hair were extracted and derivatized with N-(2,4-dinitro-5-fluorophenyl)-L(S)-valinamide L(S)-(DNPV) to yield amphetamine diastereomers. Baseline separation of the resulting diastereomers was achieved on a high-pressure liquid-chromatography system (HPLC) coupled to a Sciex QTRAP® 5500 linear ion trap quadrupole mass spectrometer. The method was successfully validated. Analysis of hair samples from nine Elvanse® patients revealed only (S)-AMP in eight cases, one subject showed both enantiomers indicating a (side-) consumption of street amphetamine. The analysis of the 16 amphetamine users' samples showed only racemic amphetamine. Furthermore, it could be shown in a controlled study that (S)-AMP can be detected after administration of even very low doses of lisdexamfetamine and dexamphetamine which can be of interest in forensic toxicology and especially in drug-facilitated crimes (DFC). The method now enables the retrospective compliance-monitoring of ADHD patients and the differentiation between medically prescribed intake of (S)-amphetamine and abuse of illicit street amphetamine.