K21 Evaluation of Ephedrine, Pseudoephedrine, and Phenylpropanolamine Concentrations in Human Urine Samples and a Comparison of the Specificity of, DRI® Methamphetamine and Abuscreen® Online Abuscreenâ Online Screening Immunoassays

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The purpose of this study was to evaluate the ability of two amphetamine-like screening reagents to exclude ephedrine (EPH), pseudo ephedrine (PSEPHE), and phenylpropanolamine (PPA) from producing false positive screening results. The study also sought to characterize the prevalence and concentration distributions of human urine samples containing EPH, PSEPHE, and PPA that produced positive screening results for the amphetamine drug class.

Two immunoassays were evaluated DRI® amphetamines and Abuscreen® Online amphetamines. Reagents were run according to manufacturer specifications using a Hitachi Modular DDP system. Approximately 27,400 randomly collected human urine samples from Navy and Marine members were screened. All assays were calibrated using a single point, qualitative cutoff standard with the manufacturer recommended compound at the department of defense cutoff (500 ng/ml). Samples were prepared by solid phase extraction after the pretreatment with sodium periodate and addition of d11 AMP, d14 MTH, d5 MDA and d5 MDMA as internal standards for the determination of AMP, MTH, MDA and MDMA. For the determination PSEPH, EPH, and PPA (in samples which did not confirm for the presence of AMP, MTH, MDMA or MDA) a similar solid phase extraction was utilize with out pretreatment with sodium periodate and with n-ethyl-benzylamine used as the internal standard. GC/MS was used for the analysis of all samples as previously described [stout et al JAT 2002 26:XX-XX]

As previously reported, one thousand one hundred and four samples screened positive by the DRI AMP kit of which 1.99% confirmed positive for the presence of AMP, MTH, MDA or MDMA. For the Online reagent 317 screened positive of which 7.94% confirmed positive for AMP, MTH, MDA or MDMA. Eight hundred and thirty three of the non-confirming samples were confirmed for the presence of EPH, PSEPH and PPA, all contained PSEPH. The mean PSEPH concentration was 126,000 ng/ml with a range of 5,700 ng/ml to 2,500,000 ng/ml. Consistent with the relative reported cross reactivities, concentrations of samples positive by DRI only were less than those positive by both Online and DRI (DRI mean for 574 samples of 84,000 ng/ml and for 258 Online positives of 218,000 ng/ml $p<0.05$). PPA was present in 28% of the samples with a mean concentration of 18,000 ng/ml and a range of 285 ng/ml to 448,000 ng/ml. EPH was present in 30% of the samples with a mean concentration of 64,000 ng/ml and a range of 437 to 859,000 ng/ml. In 76% of samples where PPA was present it was present in concentrations greater than 10% of the PSEPH concentration. In all but 4 samples (2%), when PPA was present, so was EPH. When compared to the entire screened sample set, PSEPH was present in approximately 3%, EPH in 0.9% and PPA in 0.8% of the samples.

The results indicate that cross reactivities for EPH, PSEPH and PPA are greater than reported for these reagents. While the reagents may produce fewer false positives due to PSEPH at a cutoff of 1000 ng/ml, at a 500 ng/ml cutoff a substantial number of false positive screening results were obtained. This indicates that continued work is necessary to improve the specificity of amphetamine screening reagents particularly if lower cutoff concentrations are to be used.

The distribution of concentrations indicates that very large concentrations of EPH, PSEPH and PPA are common. The presence of PPA was striking in its prevalence in light of the removal of PPA containing over the counter products. Also PPA was present in concentrations far in excess of what would be expected from reported metabolism of PSEPH to PPA (approximately 1%). This suggests either a continued commercial source of PPA containing products or PPA as a possible substantial contaminant of some EPH and PSEPH containing products.

Immunoassay, Ephedrine, Pseudoephedrine

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