Drug Impairment: Pairing Toxicology with Drug Recognition Expert Observations

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INTRODUCTION

The purpose of this research was to evaluate paired presumptive urine results and oral fluid samples with Drug Recognition Experts (DRE) examinations. Oral fluid samples were analyzed using two previously validated analytical methods.

MATERIALS AND METHODS

Instrumentation

Oral fluid samples were screened using an Agilent Technologies 1290 Infinity liquid chromatograph (LC) coupled to an Agilent Technologies 6530 Accurate Mass Time-of-Flight mass spectrometer (MS). Personal Compound and Database Libraries were produced in-house containing drugs of abuse (n=64). An Agilent 1290 Infinity LC system equipped with an Agilent 6470 Triple Quadrupole MS was used for quantification of buprenorphine, heroin markers (6-acetylmorphine, morphine), and synthetic opioids.

Analysis of Specimens

Urine samples (n=18) were collected with EZ-SCREEN® cups that presumptively screened for Amphetamine, Benzodiazepines, Cocaine, Methadone, Methamphetamine, Opiates, Oxycodone, Phencyclidine (PCP), and THC (cannabinoids).

Oral fluid specimens were collected via Quantisal™ devices from 20 anonymous detainees in Texas adult detention centers in accordance with a Sam Houston State University Institutional Review Board (IRB) approved protocol (# 2017-11-37550). All subjects gave written informed consent prior to collection. Specimens were refrigerated (4°C) and analyzed within 72 h. Oral fluid samples (1 mL) were extracted and analyzed using the validated methods.

DRE Examination

Examinations were performed by following the 12 step DRE process:

RESULTS AND DISCUSSION

Table 1. Toxicological findings with DRE opinion

Sample	Urine	Oral Fluid	Evaluator Opinion
01	Amphetamine, Benzodiazepine, Cocaine, Methamphetamine, Opiate, THC	Amphetamine, Cocaine, Methamphetamine, Morphine, 6-MAM	Narcotic Analgesics
02	Amphetamine, Benzodiazepine, Cocaine, Opiate	Amphetamine, Cocaine, Codeine, Methamphetamine, Morphine , 6-MAM	Narcotic Analgesics
03	Opiate	Morphine	Narcotic Analgesics
04	Amphetamine, Cocaine, Opiate, THC	Amphetamine, Codeine, Methamphetamine, Morphine , 6-MAM	Narcotic Analgesics
05	Amphetamine, Cocaine, Opiate, THC	Methamphetamine, Morphine, 6-MAM	CNS Stimulant, CNS Depressant, Cannabis
06	Amphetamine Methamphetamine, THC	Amphetamine, Methamphetamine	CNS Stimulant. Cannabis
07	Negative	Negative	Cannabis
08*	-	Amphetamine, Methamphetamine	-
09	Amphetamine, Cocaine, THC	Amphetamine, Methamphetamine	Alcohol, CNS Stimulant, Cannabis
10	Amphetamine, THC	Amphetamine, Cocaine, Methamphetamine	Cannabis
11	Amphetamine, Benzodiazepines, Opiate	Amphetamine, Methamphetamine, Morphine	CNS Depressant, Narcotic Analgesics
12	Amphetamine, Benzodiazepine ,Cocaine, Methadone, Methamphetamine, THC	Amphetamine, Cocaine, Methadone, Methamphetamine	CNS Depressant, Narcotic Analgesics
13	Amphetamine, Benzodiazepine, Cocaine, Methamphetamine, THC	Amphetamine, Methamphetamine	CNS Stimulant, CNS Depressant, Cannabis
14	Benzodiazepine, Cocaine, THC	Cocaine, Methamphetamine	CNS Stimulant, Cannabis
15	Amphetamine, Cocaine, THC	Amphetamine, Methamphetamine	CNS Stimulant, CNS Depressant, Cannabis
16*	-	Amphetamine, Methamphetamine	-
17	Amphetamine, Benzodiazepine, Cocaine, Opiate, Methadone Methamphetamine, PCP, THC	Methadone, Methamphetamine	CNS Depressant, Hallucinogen, Narcotic Analgesics
18	Amphetamine, Benzodiazepine, THC	Amphetamine, Methamphetamine	CNS Stimulant, Narcotic Analgesics
19	Benzodiazepine, Opiate, THC	Cocaine	Alcohol, CNS Depressant, Narcotic Analgesics
20	Cocaine, Opiate, THC	Amphetamine, Methamphetamine, Morphine, 6-MAM	Narcotic Analgesics

* DRE examinations and urine samples were not obtained

Table 2. Summary of results from DRE examinations

Sample	Vitals			Vertical Nystagmus	HGN	Walk and Turn	One Leg Stand		Modified Romberg Balance		Muscle Tone	Pupil Size	Reaction to Light
	Temp (°F)	BP (mmHg)	Mean HR (BPM)			Clues	Clues (L)	Clues (R)	Estimation of 30 seconds	Body Sway (in)			
01	95.9	110/58	45	No	None	4	2	2	72	3	Flaccid	Normal	Slow
02	96.9	130/72	81	No	None	2	3	4	39	2	Flaccid	Normal	Slow
03	97.7	118/70	79	No	None	2	2	1	58	2	Normal	Normal	Normal
04	98.7	124/78	73	No	None	2	2	0	28	2	Flaccid	Normal	Normal
05	99.4	108/70	93	Yes	Present	3	2	2	18	2	-	Dilated	Slow
06	98.2	138/100	76	No	None	3	2	1	25	2	Rigid	Dilated	Normal
07	97.8	138/74	73	No	None	3	0	2	47	2	Normal	Normal	Slow
09	99.8	150/92	127	No	Present	1	1	3	25	2	Flaccid	Dilated	Normal
10	98.6	118/72	82	No	None	2	0	3	44	-	Flaccid	Normal	Normal
11	98.5	118/76	69	Yes	Present	2	2	2	22	1	Rigid	Normal	Normal
12	96.0	122/80	63	No	Present	3	3	2	25	3	Flaccid	Constricted	Little
13	97.3	144/92	103	Yes	Present	4	1	1	14	2	Flaccid	Dilated	Slow
14	97.0	142/78	65	No	None	6	2	4	30	-	Rigid	Dilated	Normal
15	97.0	152/104	94	Yes	Present	3	3	4	51	2	Flaccid	Dilated	Slow
17	97.6	112/72	60	Yes	Present	3	2	3	19	2	Flaccid	Normal	Normal
18	98.0	150/110	81	No	None	4	2	1	33	3	Flaccid	Normal	Little
19	96.0	98/66	76	Yes	Present	5	3	3	90	3	Flaccid	-	-
20	93.3	138/78	60	No	None	2	2	2	26	2	Flaccid	Normal	Slow

Oral fluid was collected from 20 adults: 11 males (24 - 54 years) and 9 females (23 - 47 years). The most abundant drugs identified were CNS stimulants (methamphetamine and cocaine) and narcotic analgesics (morphine and codeine) as seen in **Fig. 1**. Overall, the results from the presumptive urine and the oral fluid analysis were comparable. There were more identifications of methamphetamine in the oral fluid, but that is not unexpected due to differences in drug detection windows between urine and oral fluid.

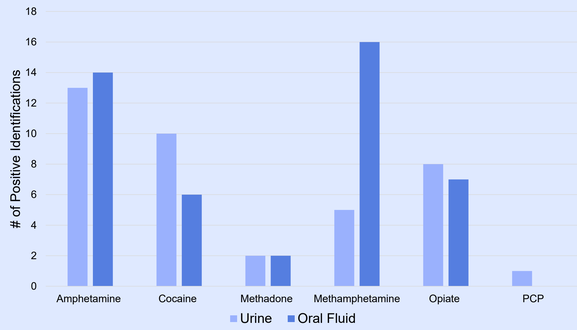

Figure 1. Identifications in oral fluid and urine

CONCLUSION

Evaluator opinion of drug class was confirmed in 15 out of 16 oral fluid samples and 17 out of 18 urine samples in reference to the scope of testing by the LC-MS methods employed (excludes cannabis). Data indicate that oral fluid may be a viable source for confirming driving under the influence of drugs (DUID).

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