

Storage and transportation studies of amphetamine, methamphetamine, benzoylecgonine, phencyclidine, morphine, oxycodone, and Δ^9 -tetrahydrocannabinol in the Quantisal™ collection device

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Background

- An investigation into the stability of drugs in oral fluid using the Quantisal™ collection device during normal storage and transportation conditions was carried out.
- The objective was to determine optimal conditions for sample handling for both collector and laboratory.
- Three separate experiments were conducted
 - stability at room temperature (25°C)
 - stability at refrigerated temperature (4°C)
 - stability during overnight transportation

Method

- Drug concentration was determined by:
 - LC-MS/MS for amphetamine (AMP), methamphetamine (METH), benzoylecgonine (BZE), phencyclidine (PCP), morphine (MOR), and oxycodone (OXYC)
 - GC-MS for Δ^9 -tetrahydrocannabinol (THC)
- All methods are fully validated and tested against both proficiency and real user specimens.

Experiment

- 50mL of neat oral fluid was collected, pooled, and divided into two 25mL aliquots
- Multi-analyte drug solutions were prepared at:
 - -50% (solution A) and +50% (solution B) of the cutoff
- Cutoff concentrations:
 - AMP (50ng/mL), METH (50ng/mL), BZE (15ng/mL), PCP (10ng/mL)
 - MOR 30ng/mL, OXYC (30ng/mL), THC (4ng/mL)
- 16 collection pads soaked up 1mL of fortified oral fluid for each level.
- When the collection pad indicator turned blue each pad was placed into a corresponding labeled tube
- Samples were stored at room temperature in the dark and analyzed in duplicate at time points 0, 7, 14, and 30 days.
- Samples were stored at 4°C and analyzed in duplicate at time points 14 and 30 days
- After analysis at time zero, specimens were packed in a thermo container which included temperature and humidity logs; shipped overnight to the East coast and back for analysis

Results

- An analytical result within +/-20% of the original value (day zero) was considered to be an acceptable analytical variable
- All drugs except THC were within this range up to day 30 when stored at room temperature in the dark
 - THC showed a 30% and 25% loss for solutions A and B respectively by day 7 with a 60% and 30% loss by day 30
- At refrigerated temperature (4°C) all drugs at all times points for both solutions A and B showed minor degradation and were within +/-20% range
 - THC showed a 10% and 2% loss for solutions A and B by day 30 when stored at refrigerated temperature
- The temperature during overnight transportation ranged from 14.8 – 30.1°C; no significant loss was seen for any drug
- The low concentration THC solution had a minor loss of 10% while the +50% solution had a loss of 3%

Data

Solution A		Expected conc (ng/mL)	Original	7-Day 25C	14-Day 25C	14-Day 4C	30-Day 25C	30-Day 4C	Transport
Benzoylecgonine		7.5	8 / 8	8 / 8	9 / 8	9 / 9	9 / 9	9 / 9	8 / 8
Amphetamine		25	25 / 25	26 / 25	25 / 24	24 / 24	26 / 25	26 / 28	27 / 27
METH		25	25 / 25	27 / 27	27 / 25	26 / 25	28 / 29	27 / 28	25 / 25
Morphine		15	15 / 15	15 / 15	15 / 15	15 / 15	17 / 16	16 / 16	15 / 15
Oxycodone		15	15 / 15	15 / 15	15 / 15	15 / 15	13 / 13	14 / 14	15 / 15
PCP		5	5 / 5	5 / 5	5 / 5	5 / 5	5 / 5	5 / 5	5 / 4.8
THC		2	2 / 2	1.4 / 1.4	1.4 / 1.4	1.6 / 1.6	0.8 / 0.8	1.8 / 1.9	1.8 / 2
Solution B		Expected conc (ng/mL)	Original	7-Day 25C	14-Day 25C	14-Day 4C	30-Day 25C	30-Day 4C	Transport
Benzoylecgonine		22.5	23 / 23	25 / 24	27 / 30	28 / 27	- / 26	26 / 28	21 / 23
Amphetamine		75	76 / 77	85 / 83	83 / 86	82 / 81	- / 85	86 / 86	81 / 81
METH		75	75 / 76	87 / 85	91 / 91	85 / 86	- / 84	86 / 87	85 / 85
Morphine		45	45 / 45	47 / 47	45 / 46	46 / 45	- / 46	50 / 48	46 / 46
Oxycodone		45	45 / 45	45 / 45	45 / 48	48 / 47	- / 42	45 / 46	45 / 45
PCP		15	15 / 15	16 / 16	16 / 16	16 / 16	15 / 15	15 / 16	15 / 15
THC		6	6 / 6	4.6 / 4.4	4.4 / 4.4	6 / 6	4.8 / 3.6	5.8 / 6	5.8 / 6

Conclusion

- Drugs are stable within the Quantisal™ oral fluid collection device when shipped overnight without cold packs in regulation containers.
- Once received into the laboratory the Quantisal™ device should be stored refrigerated at 4°C especially if THC analysis is required.
- Samples should be analyzed within the first week of receiving but can be stored for at least 30 days without significant loss. This has proven to be helpful for re-analysis purposes.



Oral Fluid