

Proficiency Testing

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RTI International

National Laboratory Certification Program
(NLCP)

Objectives

- Design and Results of SAMHSA's Oral Fluid Pilot Proficiency Testing (PT) Program - 2006
- Design and Results of RTI's Oral Fluid Pilot Proficiency Testing Program 2007-present

Background

SAMHSA's Pilot Oral Fluid PT Program

- April 1997, DTAB meeting discussed drug testing in alternate matrices
- SAMHSA NLCP oral fluid Pilot PT Program 2000-2006
 - Up to 16 laboratories participated
 - 15 cycles of samples tested
 - Important finding was a large variation in reported results
 - 2006 PT samples evaluated laboratory variability and sample stability

Design of Pilot PT Program 2006

- Evaluate the within- and between-laboratory variability
- 14 participant laboratories
- Laboratories investigated accuracy and precision issues
- Samples prepared in a single production
 - Neat in synthetic OF matrix
 - Stored frozen at -20°C between shipments
- Three sample sets sent to each lab over 1 year (0, 3, 6, 12 months)

Design of Pilot PT Program (Continued)

- Concentrations were 1.5 times the 2004 proposed initial test cutoffs
- 3 sample sets
 - Set 1: AMP (75)/MOR (60), METHAMP (75)/COD (60)
 - Set 2: COC (30)/MDA (75), BZE (30)/MDEA (75)
 - Set 3: THC (6)/PCP (15), 6-AM (6)/MDMA (75)
- To evaluate immunoassay kits, cross-reactive analytes separated
- Laboratories screened sample once and quantitated each 5 times in 5 batches

Laboratory Pilot PT Results: 2006

Cocaine and MDEA

- MDEA more challenging than COC
- Interaction plot means – lab vs. drug

Lab	COC, ng/mL	MDEA, ng/mL
B	31.9	80.7
E	30.0	85.2
J	28.9	78.1
N	33.3	86.7
P	30.0	80.0
R	31.9	78.9
S	29.6	81.1
T	29.6	78.9
W	30.4	70.4
Z	30.4	74.8

Performance Over Time:2006

Drug versus PT Cycle

- Consistent results across 1 year
- Interaction plot means – drug, ng/mL vs. cycle

Drug	Cycle 1	Cycle 2	Cycle 3	Cycle 4
6AM	5.9	6.1	6.1	5.9
AMP	80.0	78.3	75.6	76.5
BE	28.7	30.4	29.6	27.8
COD	60.0	57.0	58.3	59.1
MDA	77.4	76.5	79.1	78.3
MDMA	77.8	75.7	76.5	77.3
MOR	64.3	57.4	58.3	56.5
MAMP	79.6	77.3	76.5	79.1
PCP	15.2	14.8	14.8	14.8
THC	7.0	7.0	6.5	6.1

Performance Over Time: 2006 Drug versus PT Cycle (Cocaine & MDEA)

- Also consistent results across 1 year

Cycle	Coc	MDEA
1	30.0	77.0
2	29.4	77.6
3	30.9	80.0
4	28.3	80.6

System Variance Over 1 Year by Cycle

- Mean %CV

Analyte	0 month
AMP	12.7
MTH	12.4
MDA	12.0
MDMA	18.1
MDEA	12.9
THC	23.6
23.6COC	10.8
BE	17.0
MOR	19.8
COD	8.9
6-AM	11.2
PCP	10.4

System Variance Over 1 Year by Cycle

- Mean %CV

Analyte	0 month	3 months
AMP	12.7	13.0
MTH	12.4	10.7
MDA	12.0	10.5
MDMA	18.1	9.4
MDEA	12.9	8.1
THC	23.6	9.7
COC	10.8	9.5
BE	17.0	11.8
MOR	19.8	7.7
COD	8.9	6.8
6-AM	11.2	11.0
PCP	10.4	13.6

System Variance Over 1 Year by Cycle

- Mean %CV

Analyte	0 month	3 months	6 months
AMP	12.7	13.0	7.8
MTH	12.4	10.7	7.8
MDA	12.0	10.5	10.2
MDMA	18.1	9.4	11.5
MDEA	12.9	8.1	6.7
THC	23.6	9.7	15.6
COC	10.8	9.5	12.7
BE	17.0	11.8	13.9
MOR	19.8	7.7	7.9
COD	8.9	6.8	8.8
6-AM	11.2	11.0	9.8
PCP	10.4	13.6	13.6

System Variance Over 1 Year by Cycle

- Mean %CV

Analyte	0 month	3 months	6 months	1 year
AMP	12.7	13.0	7.8	7.8
MTH	12.4	10.7	7.8	7.3
MDA	12.0	10.5	10.2	10.1
MDMA	18.1	9.4	11.5	10.6
MDEA	12.9	8.1	6.7	6.7
THC	23.6	9.7	15.6	14.4
COC	10.8	9.5	12.7	10.5
BE	17.0	11.8	13.9	16.8
MOR	19.8	7.7	7.9	11.5
COD	8.9	6.8	8.8	12.2
6-AM	11.2	11.0	9.8	16.2
PCP	10.4	13.6	13.6	9.6

System Variance Over 1 Year by Cycle

- Mean %CV

Analyte	0 month	3 months	6 months	1 year	Urine (04-05 NLCP)
AMP	12.7	13.0	7.8	7.8	7.4
MTH	12.4	10.7	7.8	7.3	8.5
MDA	12.0	10.5	10.2	10.1	
MDMA	18.1	9.4	11.5	10.6	
MDEA	12.9	8.1	6.7	6.7	
THC	23.6	9.7	15.6	14.4	10.3
COC	10.8	9.5	12.7	10.5	
BE	17.0	11.8	13.9	16.8	7.6
MOR	19.8	7.7	7.9	11.5	7.8
COD	8.9	6.8	8.8	12.2	7.2
6-AM	11.2	11.0	9.8	16.2	9.8
PCP	10.4	13.6	13.6	9.6	7.2

Summary 2006 Pilot PT Program

- Stable material for all drugs over 1 year
- Significant decrease in variability both within and between laboratories
- For some analytes, there was increased variability in results after 1 year, illustrative of the laboratory challenge of maintaining performance
- Material performed well for GC/MS and LC/MS/MS

Background

RTI's Oral Fluid PT Program

- SAMHSA's OF Pilot PT program ran from 2000-2006
- May 2007, DRUID program contacted RTI to provide OF PT samples for 12 laboratories in 11 European countries
- December 2007, RTI initiated independent OF PT program
 - Completed 3rd year with 34 participants from US (24), Canada (2), and Europe (8)

Analytes Spiked in Oral Fluid

Amphetamine	Codeine	Alprazolam	THC
Methamphetamine	Morphine	Clonazepam	Phencyclidine
MDMA	6-Acetylmorphine	Diazepam	BZE
MDA	Hydrocodone	Flunitrzepan	Cocaine
MDEA	Hydromorphone	Lorazepam	Ethanol
	Oxycodone	Oxazepam	Zolpidem
	Methadone	Nordiazepam	Zopiclone
			Secobarbital
			Butalbital
			Phenobarbital

Initial Testing

Frequency of Drug Classes Tested

Drug Class	Initial Testing: % of Labs
SAMHSA analytes (THC, AMPs, OPIs, BZE, PCP)	100
Benzodiazepines	71
Methadone	59
Barbiturates	50
Oxycodone	32
Ethanol	26
MDMA	10
6-AM	0

Immunoassay Performance with SAMHSA analytes at 1.4 – 1.7 x Cutoff

Analyte	SAMHSA proposed cutoff (ng/mL)	Vendor cutoff (ng/mL)	Group mean (ng/mL)	% Labs reporting positive (# labs)
PCP	10	3-10	15.1	100 (20)
Morphine	40	20-40	65.6	100 (24)
BZE	20	10-30	32.9	88 (21)
MAMP	50	30-120	81	83 (24)
THC	4	3-30	5.5	72 (25)
AMP	50	30-300	87	64 (22)

Immunoassay Performance with non-SAMHSA Analytes (1.1 - 1.4 times Highest Manufacturer Cutoff)

Analyte	Manufacturer cutoff (ng/mL)	PT sample group mean (ng/mL)	% Initial test positive (# labs reporting)
Methadone	15-50	65.8	100 (16)
Oxycodone	20-40	48.1	100 (11)
Ethanol	0.2 g/L	0.28 g/L	100 (5)
Diazepam	3-25	31.9	90 (20)
Nordiazepam	3-25	30.6	88 (18)
Alprazolam	3-25	28.7	85 (20)
Oxazepam	3-25	31.3	50 (20)
Lorazepam	3-25	28.8	40 (20)
Clonazepam	3-25	32.5	39 (20)

Variability of Lab Results

- Mean %CV

Analyte	RTI oral fluid PT	SAMHSA pilot oral fluid (cycle 4-2006)	NLCP urine PT (2009-2010)
PCP	11.6	9.7	7.8
METH	13.5	7.4	7.3
AMP	14.1	7.9	7.1
BZE	16.9	16.8	8.6
COD	15.5	12.3	7.5
MOR	16.2	11.7	8.0
6-AM	19.1	16.5	8.5
THC	23.7	14.6	9.6

Summary RTI Oral Fluid Program

- SAMHSA analytes most frequently tested
- Wide range of initial testing cutoffs for each analyte
- Mean inter-laboratory %CVs for each analyte <20% except THC (23.7%)
 - NLCP urine %CVs <10%
- Qualitative and quantitative improvement expected with remedial based program