



Quantitative Drug Analysis - Cocaine HCl Test No. 18-506 Summary Report

Each sample set consisted of two items with different concentrations of cocaine HCl. Participants were asked to determine the concentration of cocaine HCl in each item. Data were returned from 27 participants and are compiled into the following tables:

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This report contains the data received from the participants in this test. Since these participants are located in many countries around the world, and it is their option how the samples are to be used (e.g., training exercise, known or blind proficiency testing, research and development of new techniques, etc.), the results compiled in the Summary Report are not intended to be an overview of the quality of work performed in the profession and cannot be interpreted as such. The Summary Comments are included for the benefit of participants to assist with maintaining or enhancing the quality of their results. These comments are not intended to reflect the general state of the art within the profession.

Participant results are reported using a randomly assigned "WebCode". This code maintains participant's anonymity, provides linking of the various report sections, and will change with every report.

Manufacturer's Information

Each sample pack consisted of two items containing different concentrations of cocaine HCl and caffeine. Participants were requested to analyze each item and report the quantitative determination of cocaine HCl present in the samples.

SAMPLE PREPARATION -

The appropriate amounts of cocaine HCl and caffeine for each Item were thoroughly mixed to ensure homogeneity.

ITEMS 1 and 2 (PREPARATION): For each Item, approximately 350 mg of the powder was weighed out and deposited into a glassine bag, which was folded and secured with a label. The folded glassine bag was placed into a small zip top bag and heat sealed closed. The heat sealed bag was then placed into a pre-labeled 5 1/2 inch coin envelope.

SAMPLE PACK ASSEMBLY: One of each of the Item 1 and Item 2 envelopes was placed into a larger pre-labeled sample pack envelope.

VERIFICATION: Laboratories that conducted predistribution analysis of the samples reported consistent results that were comparable to the preparation concentrations of cocaine HCl. The following methods were used to examine the items: LC and LC/MS.

<u>Item</u>	<u>Preparation Cocaine HCl</u>
1	62%
2	28%

Summary Comments

This test was designed to allow participants to assess their proficiency in the determination of cocaine HCl concentrations. Each participant was supplied with a sample set consisting of two items containing caffeine and different concentrations of cocaine HCl. Participants were requested to determine the cocaine HCl concentration for both items. (Refer to the Manufacturer's Information for preparation details.)

The results are separated into two tables, the reported results and the raw analytical data. The table of reported results shows the concentration that each participant would report according to their normal reporting procedures (e.g. mean, lowest result, truncated results). The table of raw data shows the results from each determination made by the laboratory to produce their reported results. Almost all of the participants reported using the mean of duplicate/several determinations as their reporting procedure.

The raw data was used to calculate the grand mean and the standard deviation for each item. No participants reported "extreme" data (± 3 STD from the grand mean) for Item 1 or Item 2 in this test. The grand mean and standard deviation are supplied to assist the participants and accrediting bodies in determining the acceptability of the results.

As a supplemental examination of the raw data, Bivariate Control Analysis was also performed to analyze the measurement of both samples simultaneously. In this analysis, an ellipse was drawn so that 95% of the time a randomly selected participant was inside of it. Two participants whose results fell outside of the 95% ellipse, but within the 99% control limit have been marked with a "**". The horizontal orientation of the ellipse, as opposed to a 45 degree orientation, indicates that the statistical variation in Item 1 is higher in comparison to Item 2. For more information regarding Bivariate Control Analysis, please see the supplemental section at the end of this report.

Participants used a variety of methods to examine the samples. The most common method of analysis utilized was GC/FID followed by LC.

Reported Results

What is the concentration of cocaine HCl in each of the samples?

TABLE 1 - Reported Results

WebCode	Item 1	Item 2	Coverage factor k
Preparation concentration:	62%	28%	
2E2GUH	60 ± 3 (%)	26 ± 2 (%)	2
4LARZE	56 ± 5.30 (%)	25 ± 2.37 (%)	2
6Q28B7	60 ± 6.0 (%)	28 ± 2.8 (%)	2
7NV296	62.2 ± 2.1 (mg/ml)	25.0 ± 1.5 (mg/ml)	
86RZP6	60.81 ± 1.17 (%)	27.55 ± 0.45 (%)	2
88XHLF	62.0 ± 1.7 (%)	25.7 ± 1.7 (%)	2
9BBK9C	59 ± 3 (%)	25 ± 2 (%)	2
9BE8KJ	62 ± 4 (%)	27 ± 4 (%)	2
A23BGC	67.5 ± 5.9 (%)	29.6 ± 2.4 (%)	2
DD2D8B	574 (µg/mg)	258 (µg/mg)	
DPYGB6	53.9 ± 3.8 (%)	25.6 ± 1.8 (%)	2
FBQCY9	59.6 ± 2.2 (%)	26.4 ± 2.2 (%)	2
FM2MQ6	60 ± 3 (%)	26 ± 2 (%)	2
G8NTC2	61.3 ± 4.8 (%)	26.8 ± 2.1 (%)	2
KD4FY2	60 ± 3 (%)	26 ± 2 (%)	2
KDHYJY	60 ± 3 (%)	25 ± 2 (%)	
L4UGNP	60.4 ± 2.90 (%)	26.0 ± 1.25 (%)	2
LQKPZX	57 ± 3 (%)	25 ± 2 (%)	2
LRZZYN	60.6 ± 3.9 (%w/w)	26.3 ± 1.9 (%w/w)	2
PFBDDH	62.1 ± 1.2 (%)	29.0 ± 1.2 (%)	1
PQDM24	55.4 ± 3.8 (%)	25.8 ± 1.8 (%)	2
Q3246U	60.3 ± 5.2 (%)	26.0 ± 2.0 (%)	2

TABLE 1 - Reported Results

WebCode	Item 1	Item 2	
Preparation concentration:	62%	28%	Coverage factor k
QEVKUV	62 ± 8 (%)	27 ± 3 (%)	2.576
RX8KPF	55.6 ± 5 (% m/m)	24.6 ± 2.2 (% m/m)	9%
V8XLAN	59.98 ± 0.8 (%)	26.39 ± 0.16 (%)	
WUM9P2	57 ± 3 (%)	26 ± 2 (%)	2
Y7UXHN	52.1 ± 5.8 (%)	24.8 ± 2.8 (%)	2.576

Reporting Procedures

TABLE 2

WebCode	Reporting Procedures
2E2GUH	The mean of duplicate/several determinations.
4LARZE	The mean of duplicate/several determinations.
6Q28B7	The mean of duplicate/several determinations.
7NV296	The mean of duplicate/several determinations.
86RZP6	The mean of duplicate/several determinations.
88XHLF	The mean of duplicate/several determinations.
9BBK9C	The mean of duplicate sample preparations and duplicate injections of each preparation.
9BE8KJ	The mean of duplicate/several determinations.
A23BGC	The mean of duplicate/several determinations.
DD2D8B	The mean of duplicate/several determinations.
DPYGB6	The mean of duplicate/several determinations.
FBQCY9	The mean of duplicate/several determinations.
FM2MQ6	The mean of duplicate/several determinations.
G8NTC2	The mean of duplicate/several determinations.
KD4FY2	The mean of duplicate/several determinations.
KDHYJY	The mean of duplicate/several determinations.
L4UGNP	The mean of duplicate/several determinations.
LQKPZX	The mean of duplicate/several determinations.
LRZZYN	The mean of duplicate/several determinations.
PFBDHH	The mean of duplicate/several determinations.
PQDM24	The mean of duplicate/several determinations.
Q3246U	The mean of duplicate/several determinations.
QEVKUV	The mean of duplicate/several determinations.
RX8KPF	the chosen value of duplicate / several determinations
V8XLAN	The mean of duplicate/several determinations.

TABLE 2

WebCode	Reporting Procedures
WUM9P2	The mean of duplicate/several determinations.
Y7UXHN	The mean of duplicate/several determinations.

Response Summary	Participants: 27
The mean of duplicate/several determinations:	26 (96.3%)
The lowest value of duplicate/several determinations:	0 (0.0%)
Other:	1 (3.7%)

Raw Data

List of raw data determinations in percent.

TABLE 3 - Item 1

WebCode	Item 1		Preparation target concentration : 62%				Mean
2E2GUH	60.63	60.69					60.66
4LARZE	56.91	54.53					55.72
6Q28B7	59.00	61.10					60.05
7NV296	62.02	62.38					62.20
86RZP6	60.40	60.21	61.66	60.98	60.33	61.26	60.81
88XHLF	62.10	62.20	62.00	62.00			62.08
9BBK9C	60.01	59.96	59.69	59.74			59.85
9BE8KJ	60.82	63.02					61.92
A23BGC	67.50	68.28	65.77	67.79	67.10	68.79	67.54
DD2D8B	58.40	56.40					57.40
DPYGB6	61.30	62.24	59.76	60.21			60.88
FBQCY9	59.90	59.93	59.31	59.31			59.61
FM2MQ6	59.99	60.07	59.96	60.04			60.01
G8NTC2	60.55	60.61	61.73	62.28			61.29
KD4FY2	60.49	60.48					60.48
KDHYJY	60.60	60.74	60.28	60.48			60.53
L4UGNP	59.80	61.00					60.40
LQKPZX	57.68	57.77					57.72
LRZZYN	60.34	60.92					60.63
PFBDDH	63.60	60.60					62.10
PQDM24	53.90	56.80					55.35
Q3246U	59.79	59.19	61.79	60.17	59.98	60.87	60.30
QEVKUV	61.83	62.54	62.72				62.36
RX8KPF	48.70	60.30	55.60	55.80	55.60		55.20
V8XLAN	60.94	59.11	59.89				59.98
WUM9P2	57.25	56.87					57.06
Y7UXHN	52.40	51.90	51.90				52.07

Statistical Analysis for Item 1

Grand Mean	59.78	Number of Participants Included	27	Number of Participants without Raw Data	0
Standard Deviation	2.973	Number of Participants Excluded	0		

TABLE 3 - Item 2

WebCode	Item 2		Preparation target concentration : 28%					Mean
2E2GUH	26.79	26.81						26.80
4LARZE	24.75	25.02						24.89
6Q28B7	27.90	28.10						28.00
7NV296	24.56	25.48						25.02
86RZP6	27.97	27.53	27.35	27.48	27.62	27.38		27.56
88XHLF	25.50	25.50	26.10	26.10				25.80
9BBK9C	26.20	26.13	23.87	23.90				25.02
9BE8KJ	26.33	27.12						26.73
A23BGC	29.72	29.93	29.33	29.71	29.22	29.72		29.61
DD2D8B	25.90	25.70						25.80
DPYGB6	25.86	26.15	25.64	25.70				25.84
FBQCY9	26.57	26.46	26.26	26.28				26.39
FM2MQ6	26.49	26.42	26.40	26.39				26.43
G8NTC2	26.61	26.81	26.70	26.97				26.77
KD4FY2	26.70	26.68						26.69
KDHYJY	25.12	25.19						25.16
L4UGNP	25.80	26.20						26.00
LQKPZX	25.79	25.79						25.79
LRZZYN	25.97	26.70						26.34
PFBDDH	29.80	30.60	27.40	31.50	23.90	25.10	25.80	27.73
PQDM24	25.60	26.00						25.80
Q3246U	26.22	26.23	26.02	25.96	25.82	25.86		26.02
QEVKUV	28.19	27.30	27.33					27.61
RX8KPF	25.80	24.00	24.60	24.30	24.50			24.64
V8XLAN	26.45	26.21	26.52					26.39
WUM9P2	26.61	26.53						26.57
Y7UXHN	25.00	24.80	24.50					24.77

Statistical Analysis for Item 2					
Grand Mean	26.30	Number of Participants Included	27	Number of Participants without Raw Data	0
Standard Deviation	1.129	Number of Participants Excluded	0		

TABLE 3 - Response Summary

Response Summary	Item 1	Item 2
Preparation concentration	62%	28%
Grand Mean	59.78	26.30
Standard Deviation	2.973	1.129

Method of Analysis

TABLE 4 - Methods

WebCode	GC	LC	FTIR	GC/MS	LC/MS	UV	GC/FID	Other
2E2GUH							✓	
4LARZE							✓	
6Q28B7		✓		✓				
7NV296		✓						
86RZP6		✓				✓		
88XHLF	✓							
9BBK9C							✓	
9BE8KJ								HPLC with UV/DAD detector
A23BGC							✓	
DD2D8B		✓				✓		
DPYGB6		✓						
FBQCY9							✓	
FM2MQ6	✓							
G8NTC2		✓						
KD4FY2							✓	
KDHYJY		✓						
L4UGNP		✓						
LQKPZX							✓	
LRZZYN		✓				✓		
PFBDDH				✓				
PQDM24							✓	
Q3246U							✓	
QEVKUV					✓			
RX8KPF								HPLC-UV
V8XLAN							✓	HPLC
WUM9P2	✓							
Y7UXHN							✓	

Response Summary

Participants	GC	LC	FTIR	GC/MS	LC/MS	UV	GC/FID
27	3	9	0	2	1	3	11
Percent	11.1%	33.3%	0.0%	7.4%	3.7%	11.1%	40.7%

Additional Comments

TABLE 5

WebCode	Additional Comments
2E2GUH	Duplicate injections of one sample preparation per unit.
6Q28B7	Caffeine also detected in Item 1 and Item 2.
86RZP6	Both items contained additionally caffeine (quantitation of both cocaine*HCl and caffeine showed: each item contains cocaine*HCl + caffeine = 100%, no other ingredients).
9BE8KJ	Item 1- caffeine present, Item 2- caffeine present
L4UGNP	Results would normally be reported as base drug so calculation was performed to convert result to HCl salt. Caffeine also present in each sample
LRZZYN	Caffeine indicated in each of items 1 and 2.
QEVKUV	[From Table 2 - Reporting Procedures: "The mean of duplicate/several(3) determinations"]
V8XLAN	The main result was given from HPLC. In addition GC/FID analysis was performed for confirmation and the following results were obtained: ITEM 1 = 52.94% +/- 0.73, ITEM 2 = 23.45% +/- 0.11

Supplemental: Hotelling T-Squared Bivariate Control Analysis

Hotelling T-Squared Bivariate Control Analysis is used in many other industries to examine results. Although not typically used in forensic science, CTS is presenting an introduction to this type of statistical data analysis. A laboratory may choose to delve deeper in a participant's results by studying both sets of statistics available in this report. The statistics presented in Table 3 - Raw Data of this report examine the results of each item independently of each other. However, because the same materials are chosen for both samples, there should be a correlation of measurement performance between the two samples. A bi-variate analysis technique judges measurement performance on both samples simultaneously, represented as an ellipse. For each participant, the mean of Item 1 (x-axis) is plotted against the mean of Item 2 (y-axis). The horizontal and vertical cross-hairs are the grand means for each Item. When 20 or more participants are included in the statistics, an ellipse is drawn so that 95% of the time a randomly selected participant will be included inside.

When considering your participant's position on the plot relative to the ellipse, remember that, generally speaking, if a participant's plotted point falls on the major axis outside of the ellipse, the participant is consistent in its measurements between the two samples but exhibits an offset from the grand mean (systematic difference). If a plotted point falls to the side of the ellipse, it indicates possible differences in the way that the participant tested the two samples or differences in sample behavior (consistency difference). The two-sample plot enables you to see which sample, if either, is "extreme" and to ascertain the nature of the "extreme" data.

Systematic Difference

Bias is illustrated in the control ellipse on the two sample plot. If a particular analysis/sample combination did not show bias, the control ellipse would become a circle. Differences in procedures, conditions, instrumentation and sample preparation all contribute to the bias of a participant. When these differences become too large, a participant may receive a Data Flag. When the test results for both samples are both high or low compared to the group, a participant has a fixed set of factors on which to focus to identify a cause. Furthermore, since additional testing on similar samples should produce similar high or low results, it is possible to determine that a systematic error has been successfully corrected.

Consistency Difference

The participant's results indicate that there are differences in the way the two samples tested (the plotted point falls to the side of the ellipse). This type of error may be attributed to the analyst deviating from the procedure when testing one of the samples or a material interaction occurrence with the instrument or room conditions. The inconsistency is reflected in the Comparative Performance Values (CPV) for the two samples, such as a +1.5 CPV for Item 1 and a -2.2 CPV for Item 2. CPV is the number of standard deviations a value is from the grand mean.

Key for Data Flags		
<u>Data Flag</u>	<u>Statistically Included/Excluded</u>	<u>Explanation</u>
*	Included	Results fall outside 95% ellipse, but within a 99% control limit (ellipse) that is calculated.
X	Excluded	Results fall outside of 99% control limit.
M	Excluded	Data is missing for at least one item

Bivariate Control Analysis

WebCode	Data Flag	Item 1			Item 2		
		Participant Mean	Difference from Grand Mean	CPV	Participant Mean	Difference from Grand Mean	CPV
2E2GUH		60.66	0.876	0.29	26.80	0.498	0.44
4LARZE		55.72	-4.065	-1.37	24.89	-1.416	-1.25
6Q28B7		60.05	0.265	0.09	28.00	1.699	1.50
7NV296		62.20	2.415	0.81	25.02	-1.281	-1.13
86RZP6		60.81	1.022	0.34	27.56	1.254	1.11
88XHLF		62.08	2.290	0.77	25.80	-0.501	-0.44
9BBK9C		59.85	0.066	0.02	25.02	-1.279	-1.13
9BE8KJ		61.92	2.133	0.72	26.73	0.426	0.38
A23BGC	*	67.54	7.754	2.61	29.61	3.304	2.93
DD2D8B		57.40	-2.385	-0.80	25.80	-0.501	-0.44
DPYGB6		60.88	1.093	0.37	25.84	-0.464	-0.41
FBQCY9		59.61	-0.172	-0.06	26.39	0.091	0.08
FM2MQ6		60.01	0.228	0.08	26.43	0.125	0.11
G8NTC2		61.29	1.508	0.51	26.77	0.471	0.42
KD4FY2		60.48	0.699	0.24	26.69	0.388	0.34
KDHYJY		60.53	0.741	0.25	25.16	-1.146	-1.02
L4UGNP		60.40	0.615	0.21	26.00	-0.301	-0.27
LQKPZX		57.72	-2.064	-0.69	25.79	-0.512	-0.45
LRZZYN		60.63	0.845	0.28	26.34	0.034	0.03
PFBDDH		62.10	2.315	0.78	27.73	1.427	1.26
PQDM24		55.35	-4.435	-1.49	25.80	-0.501	-0.44
Q3246U		60.30	0.514	0.17	26.02	-0.283	-0.25
QEVKUV		62.36	2.579	0.87	27.61	1.305	1.16
RX8KPF		55.20	-4.585	-1.54	24.64	-1.661	-1.47
V8XLAN		59.98	0.195	0.07	26.39	0.092	0.08

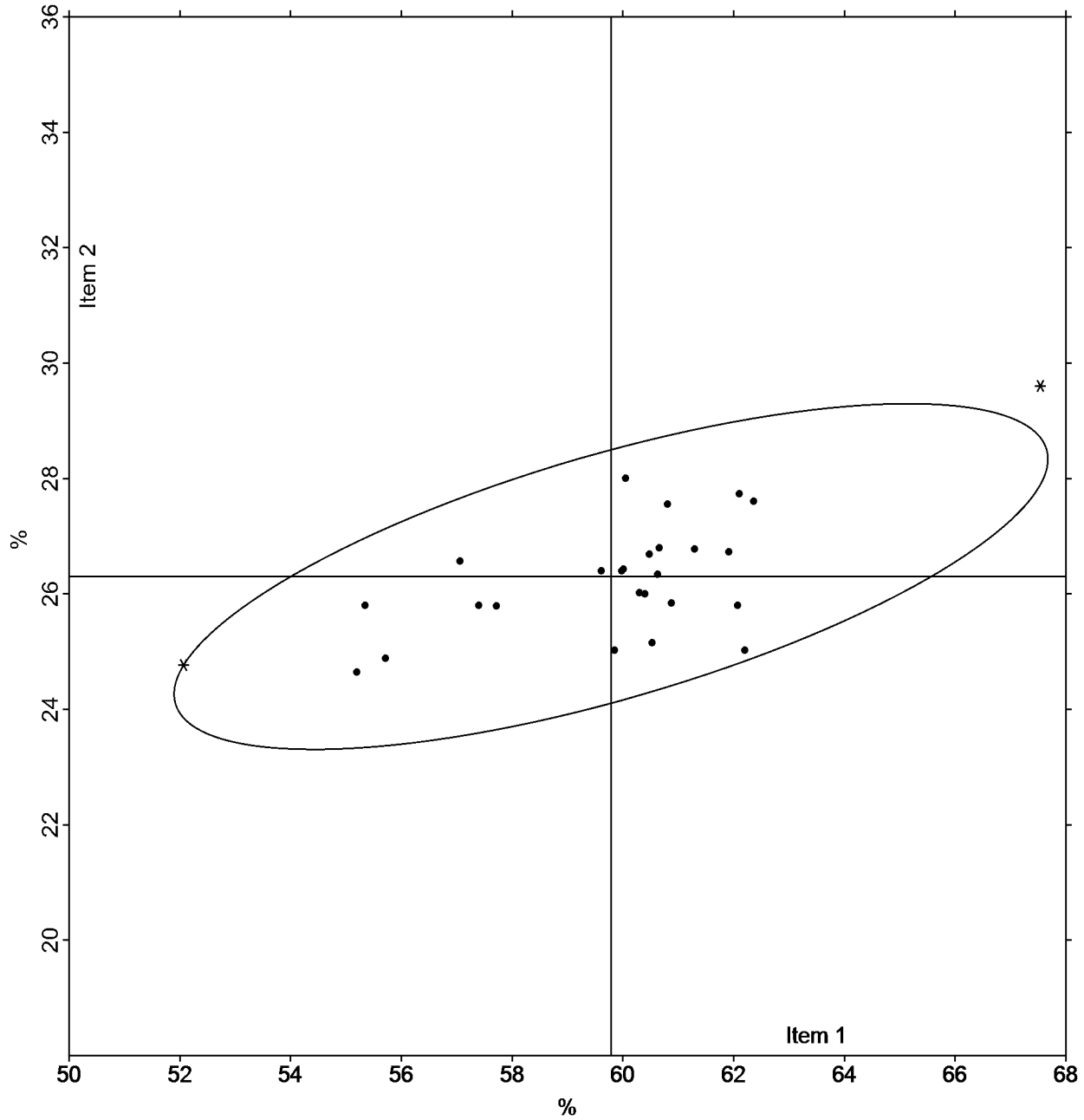
WebCode	Data Flag	Item 1			Item 2		
		Participant Mean	Difference from Grand Mean	CPV	Participant Mean	Difference from Grand Mean	CPV
WUM9P2		57.06	-2.728	-0.92	26.57	0.267	0.24
Y7UXHN	*	52.07	-7.718	-2.60	24.77	-1.535	-1.36

Response Summary		Item 1	Item 2
Preparation Concentration		62%	28%
Grand Mean		59.78	26.30
Standard Deviation		2.97	1.13
Participants Included: 27		Participants Excluded: 0	Participants without Raw Data for both items: 0

Bivariate Control Analysis

Item 1 Grand Mean: 59.78

Item 2 Grand Mean: 26.30



-End of Report-
(Appendix may follow)

Appendix: Data Sheet

Collaborative Testing Services ~ Forensic Testing Program

Test No. 18-506: Quantitative Drug Analysis - Cocaine HCl

DATA MUST BE RECEIVED BY December 10, 2018 TO BE INCLUDED IN THE REPORT

Participant Code:

WebCode:

Accreditation Release Statement

CTS submits external proficiency test data directly to ASCLD/LAB, ANAB, and A2LA. Please select one of the following statements to ensure your data is handled appropriately.

This participant's data is intended for submission to ASCLD/LAB, ANAB, and/or A2LA. (Accreditation Release section on the last page must be completed and submitted.)

This participant's data is NOT intended for submission to ASCLD/LAB, ANAB or A2LA.

Scenario:

Investigators have submitted two powdered cocaine HCl samples from separate cases to be quantitatively examined. Using your laboratory's procedures, analyze each sample and report the quantitative determination of cocaine HCl present in the samples.

Note:

-Please follow your laboratory's policies and procedures for sample homogenization.

-This is not intended as a qualitative test but rather as a quantitative examination of the cocaine HCl present in the samples.

Items Submitted (Sample Pack DQ2):

Items 1 & 2: Powdered cocaine HCl samples

1a.) What is the concentration of cocaine HCl in each of the samples? (Results should be reported using your laboratory reporting criteria for decimal places, uncertainty, and units.)

	<u>Reported Concentration</u>		<u>Uncertainty (k=_____)</u>		<u>Units</u>
Item 1:		±		(
Item 2:		±		(

1b.) Are the values listed above:

The mean of duplicate / several determinations? The lowest value of duplicate / several determinations?

Other? (Specify): _____

Please return all pages of this data sheet.

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Participant Code:

WebCode:

2.) Please list your raw data determinations below in percent of cocaine HCl. (Results not reported in % will be excluded from statistical calculations).

Item 1 (%)		Item 2 (%)	
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

3.) What methods were used to quantitatively examine the items?

- GC LC FTIR
- GC/MS LC/MS UV
- GC/FID Other (specify): _____

4.) Additional Comments

<p>Return Instructions: Data must be received via online data entry, fax (please include a cover sheet), or mail by <u>December 10, 2018</u> to be included in the report. Emailed data sheets are not accepted.</p> <p>QUESTIONS? TEL: +1-571-434-1925 (8 am - 4:30 pm EST) EMAIL: forensics@cts-interlab.com www.ctsforensics.com</p>	<p>Participant Code:</p> <p>ONLINE DATA ENTRY: www.cts-portal.com</p> <p>FAX: +1-571-434-1937</p> <p>MAIL: Collaborative Testing Services, Inc. P.O. Box 650820 Sterling, VA 20165-0820 USA</p>
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Please return all pages of this data sheet.

Collaborative Testing Services ~ Forensic Testing Program

RELEASE OF DATA TO ACCREDITATION BODIES

The following Accreditation Releases will apply only to:

Participant Code:

WebCode:

for Test No. **18-506: Quantitative Drug Analysis - Cocaine HCl**

This release page must be completed and received by December 10, 2018 to have this participant's submitted data included in the reports forwarded to the respective Accreditation Bodies.

Have the laboratory's designated individual complete the following steps **only if your laboratory is accredited in this testing/calibration discipline** by one or more of the following Accreditation Bodies.

Step 1: Provide the applicable Accreditation Certificate Number(s) for your laboratory

ANAB Certificate No. _____

(Include ASCLD/LAB Certificate here)

A2LA Certificate No. _____

Step 2: Complete the Laboratory Identifying Information in its entirety

Signature and Title _____

Laboratory Name _____

Location (City/State) _____

Return Instructions

Accreditation Release

Please submit the completed Accreditation Release at the same time as your full data sheet. See Data Sheet Return Instructions on the previous page.

*Questions? Contact us 8 am-4:30 pm EST
Telephone: +1-571-434-1925
email: forensics@cts-interlab.com*

Please return all pages of this data sheet.