



Evaluation of SoHT Proficiency Test HEtG 2016/2

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BAM reference	16029294
Copy	2nd of 2 copies
Customer	Society of Hair Testing (SoHT)
Order date	10 June 2016
Reference	HEtG 2016/2
Receipt of order	13 June 2016
Test samples	Interlaboratory comparison data collected and provided by the SoHT
Receipt of samples	08 December 2016
Test date	08-13 December 2016
Test location	BAM Branch Adlershof
Test procedure according to	Evaluation of the test results on ethyl glucuronide (EtG) in hair ISO 5725 - Part 5
Test results	See Enclosure

TEST REPORT

This test report consists of page 1 to 2 and one enclosure.

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Opinions and interpretations

The relative reproducibility standard deviations observed in cases of samples B and C from all laboratory means is close to the value predicted by the *Horwitz* equation. This is in accordance with the observations from earlier rounds and due to the fact that the laboratories have adjusted their analytical procedures (extraction, calibration) to this concentration range. In case of sample A the mean EtG content is below the SoHT cut-off and close to the limit of quantification in many laboratories. Expectedly, the relative reproducibility standard deviation exceeds strongly the prediction by the *Horwitz* equation.

The table reveals that pulverisation led to higher means in cases of samples B and C. Though sample A appears to display the opposite this is obviously due to the low EtG content close to typical limits of detection and the limited number of laboratory results (see enclosure).

Pulverisation	Sample	Mean (pg/mg)	Reproducibility standard deviation (pg/mg)	Rel. reproducibility standard deviation (%)
Yes	HEtG 16/2-A	3.000	2.146	71.52 %
No	HEtG 16/2-A	4.267	3.686	86.38 %
Yes	HEtG 16/2-B	74.606	14.172	19.00 %
No	HEtG 16/2-B	57.420	13.988	24.36 %
Yes	HEtG 16/2-C	20.641	4.321	20.93 %
No	HEtG 16/2-C	15.736	6.981	44.36 %

**Bundesanstalt für Materialforschung und -prüfung (BAM)
12200 Berlin**

13. January 2016

BAM-1.2

By order



Prof. Dr. Irene Nehls
Head of Division

By order



Dr. Roland Becker
Technical Administrator

Enclosure

Enclosure

Table 1 contains the individual laboratory results for hair samples A, B, and C as received from the SoHT along with the z-scores as basis for proficiency assessment. They were derived using the mean of all laboratory results according to ISO 5725 (part 5) and the target standard deviation taken from the *Horwitz* model as agreed upon with the SoHT.

Table 2 contains the individual laboratory results for hair samples A, B, and C as received from the SoHT along with the z-scores as basis for proficiency assessment. Alternatively, they were derived using the mean of those laboratory results which were obtained after hair pulverisation. The target standard deviation was taken from the *Horwitz* model as agreed upon with the SoHT.

The evaluation was done using the PROLab Plus software (quoData, Dresden, Germany).

Pages 4-9 depict the respective result presentations along with the provided information on respective sample preparation and instrumental procedures.

Proficiency assessment based on the mean of ALL participants

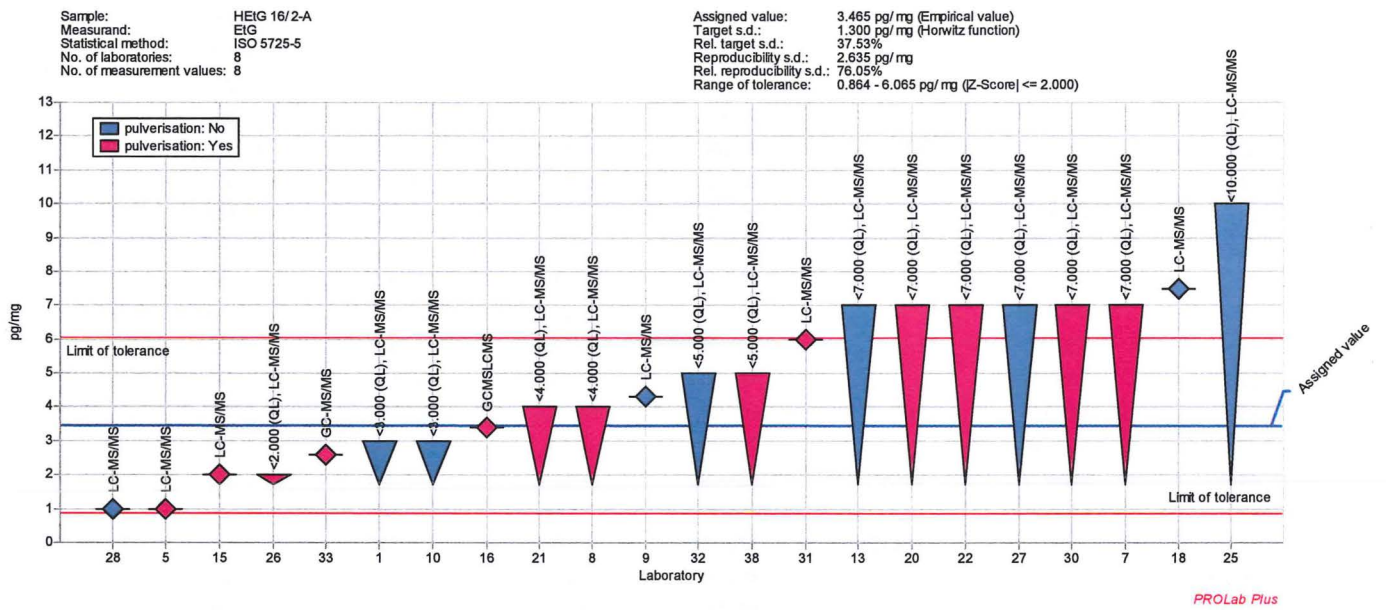
Laboratory	HEtG 16/2-A		HEtG 16/2-B		HEtG 16/2-C	
	EtG content (pg/mg)	Z score	EtG content (pg/mg)	Z score	EtG content (pg/mg)	Z score
1	< 3.000		47.300	-1.231	8.100	-1.942
2			49.000	-1.126		
3			73.300	0.380	24.600	1.096
5	1.000	-1.896	85.000	1.106	20.000	0.249
6	0.0	-2.665	64.500	-0.165	14.000	-0.855
7	< 7.000		70.000	0.176	20.000	0.249
8	< 4.000		60.000	-0.444	24.500	1.078
9	4.300	0.643	70.000	0.176	20.000	0.249
10	< 3.000		56.500	-0.661	6.500	-2.236
12			45.500	-1.343	12.800	-1.076
13	< 7.000		80.800	0.845	22.100	0.636
15	2.000	-1.127	76.000	0.548	20.000	0.249
16	3.400	-0.050	78.000	0.672	27.000	1.538
17			63.000	-0.258	19.000	0.065
18	7.500	3.104	44.200	-1.423	27.600	1.649
19			95.000	1.726	30.000	2.090
20	< 7.000		87.600	1.267	22.400	0.691
21	< 4.000		86.200	1.180	21.700	0.562
22	< 7.000		65.000	-0.134	18.000	-0.119
23			61.600	-0.345	10.600	-1.481
24			49.000	-1.126	12.000	-1.224
25	< 10.000		63.000	-0.258	20.000	0.249
26	< 2.000		61.100	-0.376	16.300	-0.432
27	< 7.000		46.500	-1.281	12.100	-1.205
28	1.000	-1.896	61.000	-0.382	17.000	-0.303
30	< 7.000		75.500	0.517	19.700	0.194
31	6.000	1.950	65.000	-0.134	19.000	0.065
32	< 5.000		98.000	1.912	25.000	1.170
33	2.600	-0.665	102.500	2.191	25.700	1.299
34			86.000	1.168	21.000	0.433
35			42.000	-1.560	16.000	-0.487
36			41.900	-1.566	9.800	-1.629
37			66.100	-0.066	14.700	-0.727
38	< 5.000		80.000	0.796	16.000	-0.487

	HEtG 16/2-A	HEtG 16/2-B	HEtG 16/2-C
No. of participants (according to design)	34	34	34
No. of laboratories that submitted results	22	34	33
Assigned value	3.465	67.163	18.646
Target s.d. (classical Horwitz)	1.300	16.132	5.431
Relative classical Horwitz s.d.	37.53 %	24.02 %	29.13 %
Lower limit of tolerance ($ Z \text{ score} = 2$)	0.864	34.899	7.783
Upper limit of tolerance ($ Z \text{ score} = 2$)	6.065	99.426	29.509
Mean (ISO 5725-5)	3.465	67.163	18.646
Standard error u_x of the mean	0.932	3.104	1.070
Reproducibility s.d. (ISO 5725-5)	2.635	18.099	6.147
Rel. reproducibility s.d. (ISO 5725-5)	76.05 %	26.95 %	32.97 %

Proficiency assessment based on the mean of laboratories which reported pulverisation						
Laboratory	HEtG 16/2-A		HEtG 16/2-B		HEtG 16/2-C	
	EtG content (pg/mg)	Z score	EtG content (pg/mg)	EtG content (pg/mg)	Z score	EtG content (pg/mg)
1	< 3.000		47.300	-1.548	8.100	-2.118
2			49.000	-1.452		
3			73.300	-0.074	24.600	0.669
5	1.000	-1.739	85.000	0.589	20.000	-0.108
6			64.500	-0.573	14.000	-1.122
7	< 7.000		70.000	-0.261	20.000	-0.108
8	< 4.000		60.000	-0.828	24.500	0.652
9	4.300	1.130	70.000	-0.261	20.000	-0.108
10	< 3.000		56.500	-1.027	6.500	-2.388
12			45.500	-1.650	12.800	-1.324
13	< 7.000		80.800	0.351	22.100	0.246
15	2.000	-0.869	76.000	0.079	20.000	-0.108
16	3.400	0.348	78.000	0.192	27.000	1.074
17			63.000	-0.658	19.000	-0.277
18	7.500	3.912	44.200	-1.724	27.600	1.175
19			95.000	1.156	30.000	1.581
20	< 7.000		87.600	0.737	22.400	0.297
21	< 4.000		86.200	0.657	21.700	0.179
22	< 7.000		65.000	-0.545	18.000	-0.446
23			61.600	-0.737	10.600	-1.696
24			49.000	-1.452	12.000	-1.459
25	< 10.000		63.000	-0.658	20.000	-0.108
26	< 2.000		61.100	-0.766	16.300	-0.733
27	< 7.000		46.500	-1.593	12.100	-1.442
28	1.000	-1.739	61.000	-0.771	17.000	-0.615
30	< 7.000		75.500	0.051	19.700	-0.159
31	6.000	2.608	65.000	-0.545	19.000	-0.277
32	< 5.000		98.000	1.326	25.000	0.736
33	2.600	-0.348	102.500	1.581	25.700	0.854
34			86.000	0.646	21.000	0.061
35			42.000	-1.849	16.000	-0.784
36			41.900	-1.854	9.800	-1.831
37			66.100	-0.482	14.700	-1.003
38	< 5.000		80.000	0.306	16.000	-0.784

	HEtG 16/2-A	HEtG 16/2-B	HEtG 16/2-C
No. of participants (according to design)	22	34	33
No. of laboratories that submitted results	34	34	34
Assigned value (= reference value)	3.000	74.606	20.641
Target s.d. (classical Horwitz)	1.150	17.638	5.921
Relative classical Horwitz s.d.	38.35 %	23.64 %	28.69 %
Lower limit of tolerance (Z score = 2)	0.699	39.329	8.799
Upper limit of tolerance (Z score = 2)	5.301	109.883	32.483
Mean (all results, ISO 5725-5)	3.465	67.163	18.646
Standard error u_x of the mean	0.932	3.104	1.070
Reproducibility s.d. (all results, ISO 5725-5)	2.635	18.099	6.147
Rel. reproducibility s.d. (ISO 5725-5)	76.05 %	26.95 %	32.97 %

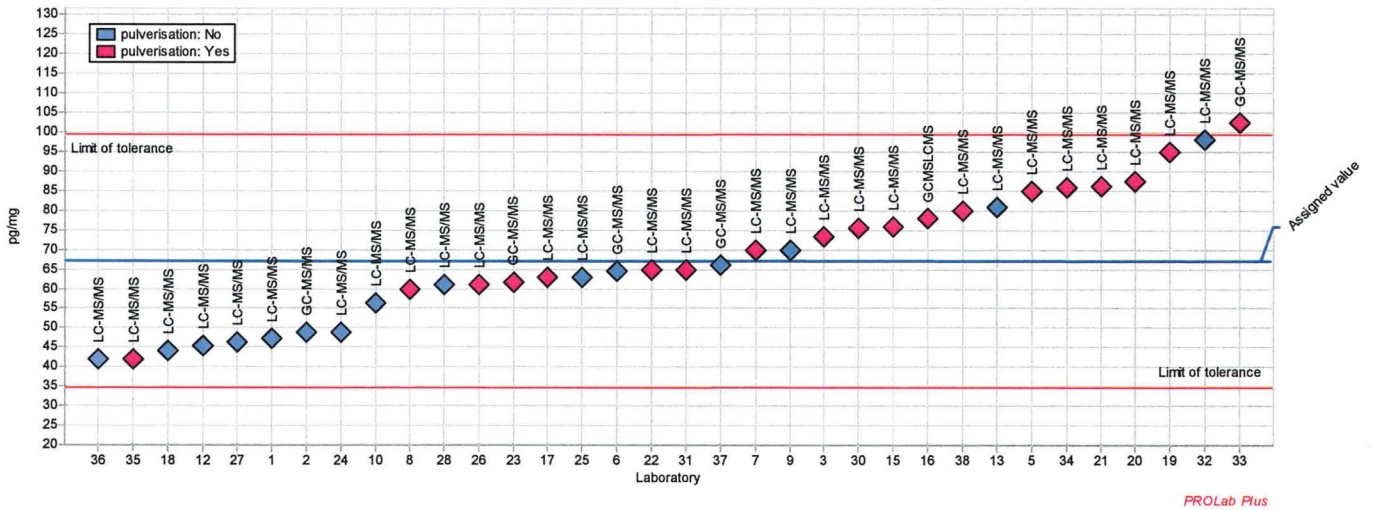
Assigned value for proficiency assessment: Mean of all participants



Assigned value for proficiency assessment: Mean of all participants

Sample: HEIG 16/2-B
 Measurand: EIG
 Statistical method: ISO 5725-5
 No. of laboratories: 34
 No. of measurement values: 34

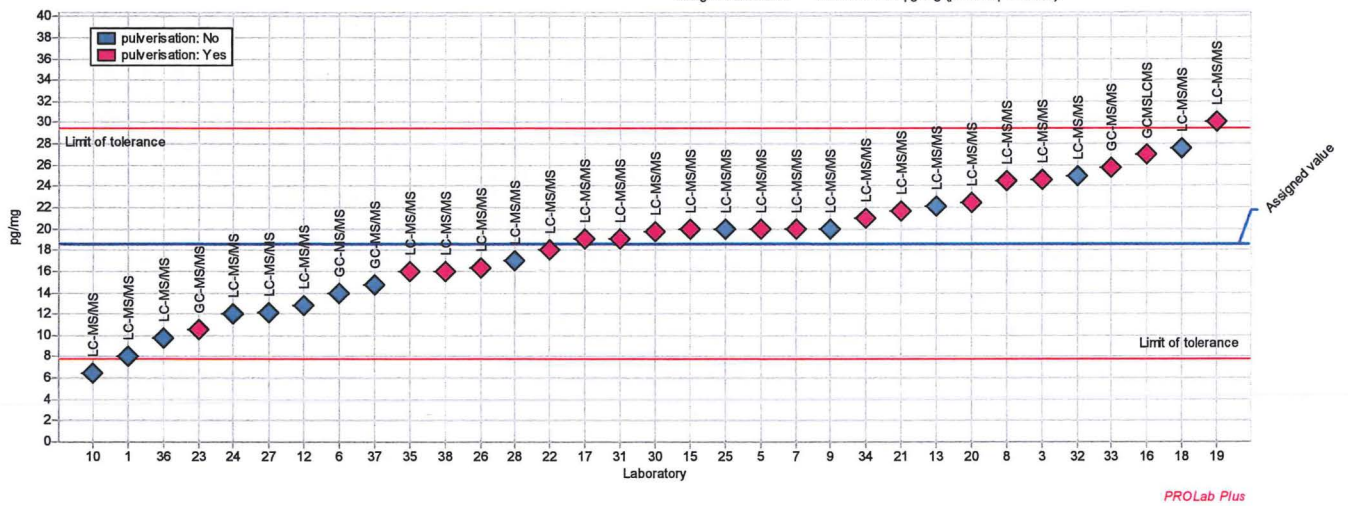
Assigned value: 67.163 pg/mg (Empirical value)
 Target s.d.: 16.132 pg/mg (Howitz function)
 Rel. target s.d.: 24.02%
 Reproducibility s.d.: 18.099 pg/mg
 Rel. reproducibility s.d.: 26.95%
 Range of tolerance: 34.899 - 99.426 pg/mg (Z-Score) <= 2.000)



Assigned value for proficiency assessment: Mean of all participants

Sample: HEIG 16/2-C
 Measurand: BIC
 Statistical method: ISO 5725-5
 No. of laboratories: 33
 No. of measurement values: 33

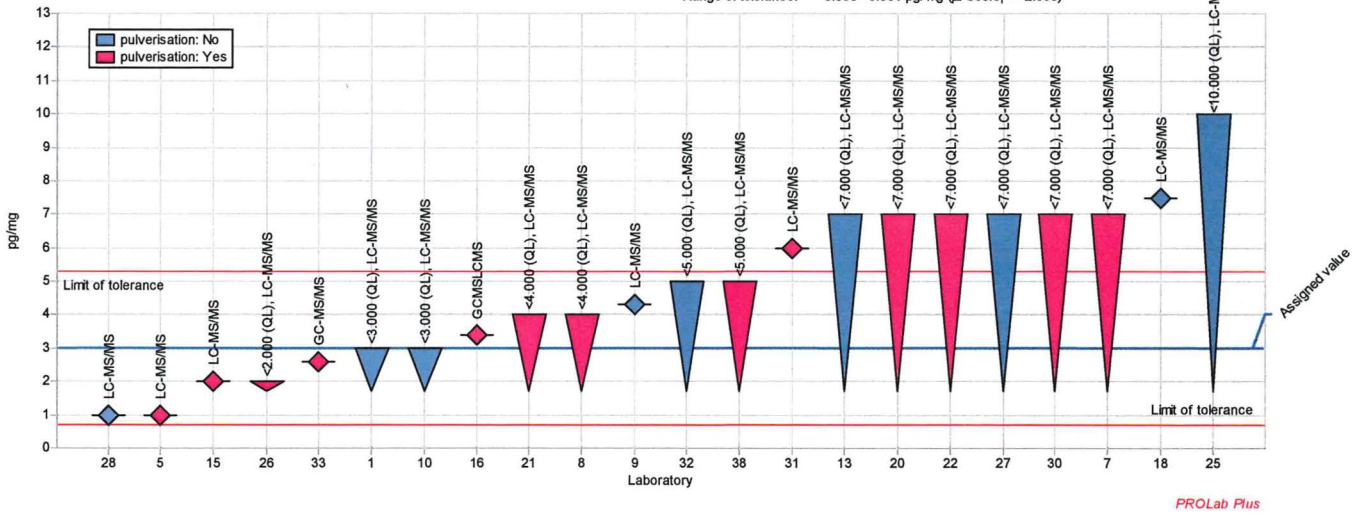
Assigned value: 18.646 pg/mg (Empirical value)
 Target s.d.: 5.431 pg/mg (Horwitz function)
 Rel. target s.d.: 29.13%
 Reproducibility s.d.: 6.147 pg/mg
 Rel. reproducibility s.d.: 32.97%
 Range of tolerance: 7.783 - 29.509 pg/mg (Z-Score) <= 2.000



Assigned value for proficiency assessment: Mean of participants which applied hair pulverisation

Sample: HEIG 16/2-A
 Measurand: EIG
 Statistical method: ISO 5725-5
 No. of laboratories: 8
 No. of measurement values: 8

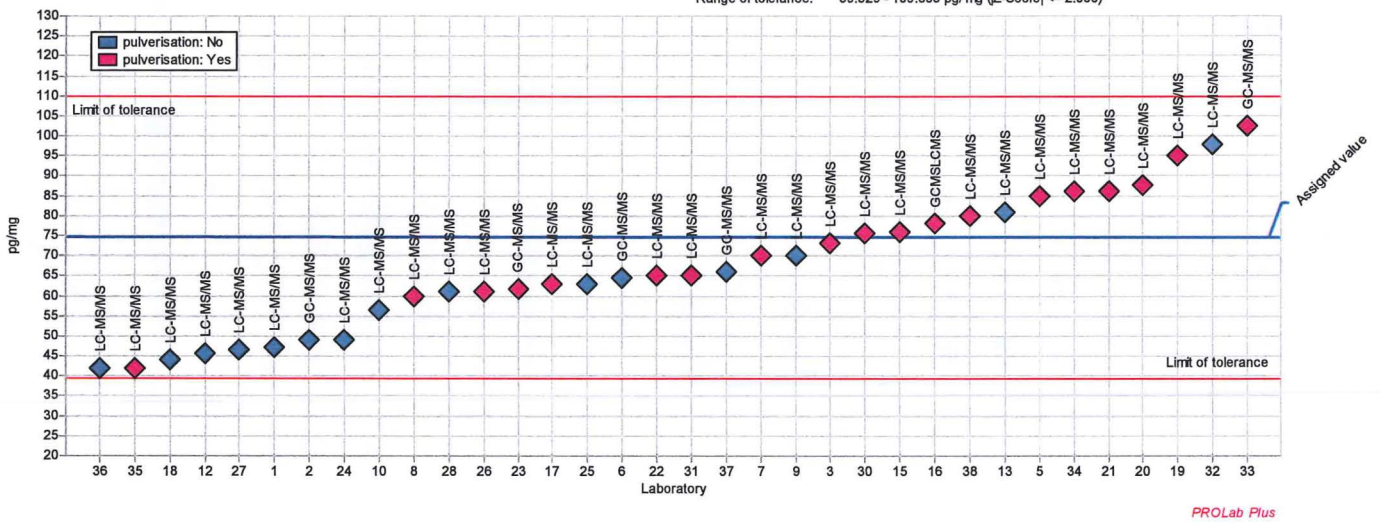
Assigned value: 3.000 pg/mg (Reference value)
 Target s.d.: 1.150 pg/mg (Horwitz function)
 Rel. target s.d.: 38.35%
 Reproducibility s.d.: 2.835 pg/mg
 Rel. reproducibility s.d.: 87.83%
 Range of tolerance: 0.699 - 5.301 pg/mg (Z-Score) <= 2.000



Assigned value for proficiency assessment: Mean of participants which applied hair pulverisation

Sample: HEIG 16/2-B
 Measurand: EtG
 Statistical method: ISO 5725-5
 No. of laboratories: 34
 No. of measurement values: 34

Assigned value: 74.606 pg/mg (Reference value)
 Target s.d.: 17.638 pg/mg (Howitz function)
 Rel. target s.d.: 23.64%
 Reproducibility s.d.: 18.099 pg/mg
 Rel. reproducibility s.d.: 24.26%
 Range of tolerance: 39.329 - 109.883 pg/mg (Z-Score| <= 2.000)



Assigned value for proficiency assessment: Mean of participants which applied hair pulverisation

Sample: HEIG 16/2-C
 Measurand: EIG
 Statistical method: ISO 5725-5
 No. of laboratories: 33
 No. of measurement values: 33

Assigned value: 20.641 pg/ mg (Reference value)
 Target s.d.: 5.921 pg/ mg (Howitz function)
 Rel. target s.d.: 28.69%
 Reproducibility s.d.: 6.147 pg/ mg
 Rel. reproducibility s.d.: 29.78%
 Range of tolerance: 8.799 - 32.483 pg/ mg (|Z-Score| <= 2.000)

