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Evaluation of SoHT Proficiency Test HEtG 2016/1

TEST REPORT

BAM reference	16029291
Copy	2nd of 2 copies
Customer	Society of Hair Testing (SoHT)
Order date	10 June 2016
Reference	HEtG 2016/1
Receipt of order	13 June 2016
Test samples	Interlaboratory comparison data collected and provided by the SoHT
Receipt of samples	10 June 2016
Test date	13-16 June 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

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

Opinions and interpretations

The relative reproducibility standard deviation of 31.8% observed in case of sample A from all laboratory means is close to the value predicted by the *Horwitz* equation (27.2%). This is probably due to the fact that the EtG content (mean: 29.3 pg/mg) is close to the cut-off set for alcohol consumption assessment by the SoHT and laboratories have adjusted their analytical procedures (extraction, calibration) to this concentration range. In cases of samples B and C the mean EtG contents are still in the SoHT cut.off range but lower than in case of sample A and it appears that this led to a slightly increased interlaboratory scatter and thus to relative reproducibility standard deviations differing somewhat more from the prediction by the *Horwitz* equation.

The table reveals that pulverisation led to higher means among laboratories using pulverisation of the hair in case of samples A and C. Though sample B appears to display the opposite this is obviously due to two extremely high results from laboratories 5 and 6. These participants did not pulverise the hair samples and their outlying results obviously increased the mean for the non-pulveriser group inappropriately (see enclose, pages 5,and 8) even though the robust evaluation procedure (ISO 5725-5) reduces such effects.

Pulverisation	Sample	Mean (pg/mg)	Reproducibility standard deviation (pg/mg)	Rel. reproducibility standard deviation (%)
Yes	HEtG 16/1-A	32.793	6.797	20.73
No	HEtG 16/1-A	23.654	9.863	41.70
Yes	HEtG 16/1-B	15.190	3.788	24.94
No	HEtG 16/1-B	21.460	21.718	101.20
Yes	HEtG 16/1-C	21.986	5.946	27.05
No	HEtG 16/1-C	14.363	6.823	47.50

Bundesanstalt für Materialforschung und -prüfung (BAM)
12200 Berlin

13. Juli 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						
	HEtG 16/1-A		HEtG 16/1-B		HEtG 16/1-C	
Laboratory	EtG content (pg/mg)	Z score	EtG content (pg/mg)	Z score	EtG content (pg/mg)	Z score
2	20.000	-1.168	11.000	-0.850	12.000	-1.281
3	21.000	-1.043			11.000	-1.462
4	31.500	0.273	14.000	-0.178	21.000	0.342
5	< 7.000		73.000	13.046	38.900	3.571
6	27.500	-0.228	126.500	25.037	20.100	0.180
7	24.000	-0.667	11.000	-0.850	12.000	-1.281
9	37.000	0.963	16.000	0.271	17.000	-0.379
10	34.000	0.586	15.000	0.046	24.000	0.883
11	23.200	-0.767				
12	20.000	-1.168	9.000	-1.298	11.000	-1.462
13	38.600	1.163	18.000	0.719	27.500	1.514
14	36.000	0.837	14.000	-0.178	23.000	0.703
16	31.700	0.298	13.400	-0.312	21.300	0.396
17	22.800	-0.817	10.400	-0.985	16.400	-0.488
19	26.300	-0.379	13.400	-0.312	12.300	-1.227
20	28.000	-0.166	15.000	0.046	19.000	-0.019
21	6.300	-2.885				
22	32.000	0.336	17.500	0.607	24.000	0.883
23	23.400	-0.742	6.800	-1.791	9.500	-1.732
24	45.000	1.965	22.000	1.615	33.500	2.597
25	29.900	0.073	11.200	-0.805	18.400	-0.127
26	27.300	-0.253	11.400	-0.760	15.200	-0.704
27	46.400	2.141	36.200	4.798	14.000	-0.921
29	39.200	1.238	14.700	-0.021	24.700	1.009
30	40.800	1.439	21.200	1.436	29.500	1.875
31	38.700	1.176	18.600	0.853	27.100	1.442
32	12.700	-2.083	7.500	-1.635	6.700	-2.237
33	30.800	0.185	15.800	0.226	24.400	0.955
34	20.000	-1.168	8.000	-1.522	12.200	-1.245

	HEtG 16/1-A	HEtG 16/1-B	HEtG 16/1-C
No. of participants (according to design)	32	32	32
No. of laboratories that submitted results	29	26	27
Assigned value	29.321	14.793	19.104
Target s.d. (classical Horwitz)	7.978	4.462	5.544
Relative classical Horwitz s.d.	27.21 %	30.16 %	29.02 %
Lower limit of tolerance (|Z score| = 2)	13.364	5.869	8.015
Upper limit of tolerance (|Z score| = 2)	45.277	23.716	30.193
Mean (ISO 5725-5)	29.321	14.793	19.104
Standard error u_x of the mean	1.760	1.104	1.526
Reproducibility s.d. (ISO 5725-5)	9.313	5.629	7.927
Rel. reproducibility s.d. (ISO 5725-5)	31.76 %	38.05 %	41.50 %
Lower confidence limit of the mean	25.801	12.585	16.053
Upper confidence limit of the mean	32.841	17.000	22.155

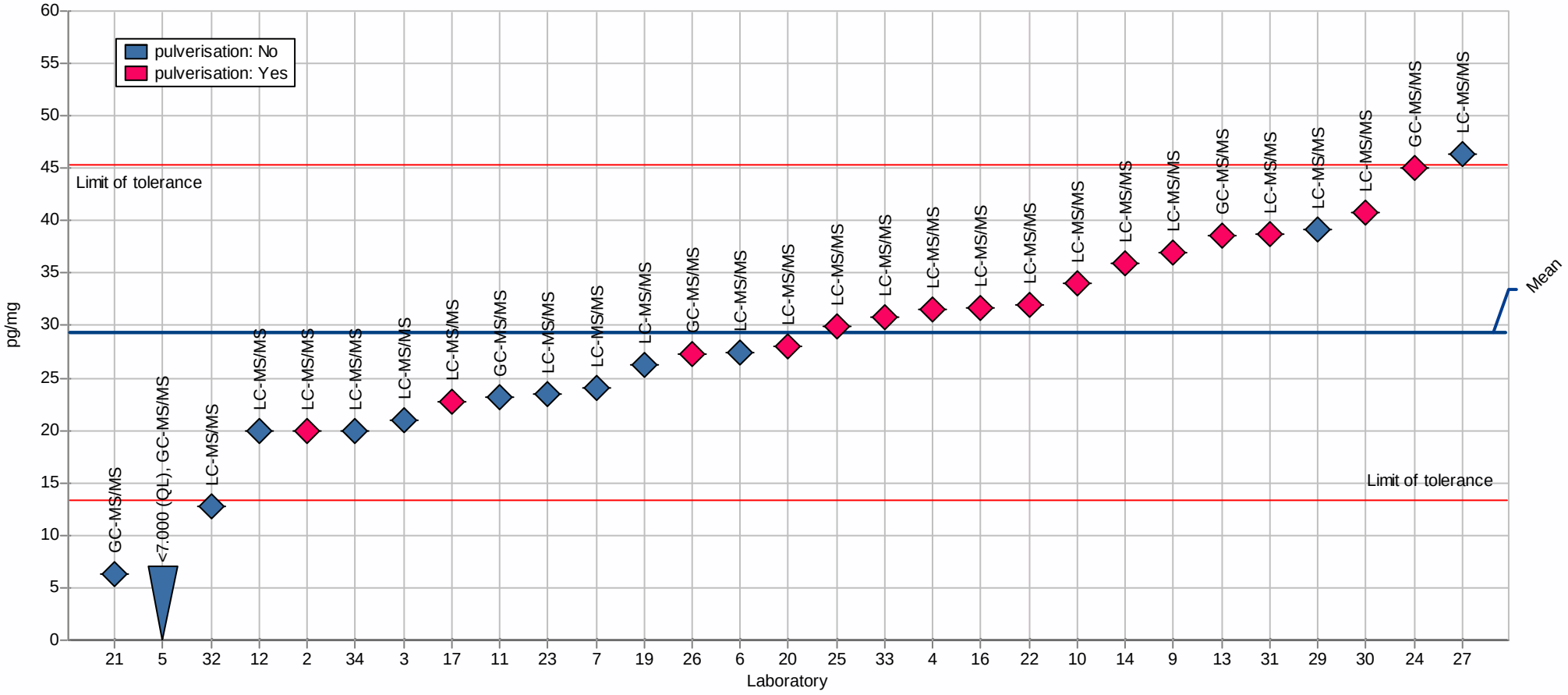
Proficiency assessment based on the mean of laboratories which reported pulverisation						
	HEtG 16/1-A		HEtG 16/1-B		HEtG 16/1-C	
Laboratory	EtG content (pg/mg)	Z score	EtG content (pg/mg)	EtG content (pg/mg)	Z score	EtG content (pg/mg)
2	20.000	-1.458	11.000	-0.918	12.000	-1.598
3	21.000	-1.344			11.000	-1.759
4	31.500	-0.147	14.000	-0.261	21.000	-0.158
5	< 7.000		73.000	12.669	38.900	2.707
6	27.500	-0.603	126.500	24.393	20.100	-0.302
7	24.000	-1.002	11.000	-0.918	12.000	-1.598
9	37.000	0.479	16.000	0.178	17.000	-0.798
10	34.000	0.138	15.000	-0.042	24.000	0.322
11	23.200	-1.093				
12	20.000	-1.458	9.000	-1.356	11.000	-1.759
13	38.600	0.662	18.000	0.616	27.500	0.883
14	36.000	0.366	14.000	-0.261	23.000	0.162
16	31.700	-0.125	13.400	-0.392	21.300	-0.110
17	22.800	-1.139	10.400	-1.050	16.400	-0.894
19	26.300	-0.740	13.400	-0.392	12.300	-1.550
20	28.000	-0.546	15.000	-0.042	19.000	-0.478
21	6.300	-3.020				
22	32.000	-0.090	17.500	0.506	24.000	0.322
23	23.400	-1.071	6.800	-1.839	9.500	-1.999
24	45.000	1.391	22.000	1.492	33.500	1.843
25	29.900	-0.330	11.200	-0.874	18.400	-0.574
26	27.300	-0.626	11.400	-0.831	15.200	-1.086
27	46.400	1.551	36.200	4.604	14.000	-1.278
29	39.200	0.730	14.700	-0.107	24.700	0.434
30	40.800	0.913	21.200	1.317	29.500	1.203
31	38.700	0.673	18.600	0.747	27.100	0.819
32	12.700	-2.290	7.500	-1.685	6.700	-2.447
33	30.800	-0.227	15.800	0.134	24.400	0.386
34	20.000	-1.458	8.000	-1.576	12.200	-1.566

	HEtG 16/1-A	HEtG 16/1-B	HEtG 16/1-C
No. of participants (according to design)	32	32	32
No. of laboratories that submitted results	29	26	27
Assigned value (= reference value)	32.793	15.190	21.986
Reference value (pulverisation only)	32.793	15.190	21.986
Target s.d. (classical Horwitz)	8.774	4.563	6.247
Absolute classical Horwitz s.d.	8.774	4.563	6.247
Relative classical Horwitz s.d.	26.76 %	30.04 %	28.41 %
Lower limit of tolerance (|Z score| = 2)	15.245	6.064	9.491
Upper limit of tolerance (|Z score| = 2)	50.341	24.316	34.481
Mean (all results, ISO 5725-5)	29.321	14.793	19.104
Standard error u_x of the mean	1.760	1.104	1.526
Reproducibility s.d. (all results, ISO 5725-5)	9.313	5.629	7.927
Rel. reproducibility s.d. (ISO 5725-5)	31.76 %	38.05 %	41.50 %
Lower confidence limit of the mean	25.801	12.585	16.053
Upper confidence limit of the mean	32.841	17.000	22.155

Assigned value for proficiency assessment: Mean of all participants

Sample:	HEtG 16/ 1-A
Measurand:	EtG
Statistical method:	ISO 5725-5
No. of laboratories:	28
No. of measurement values:	28

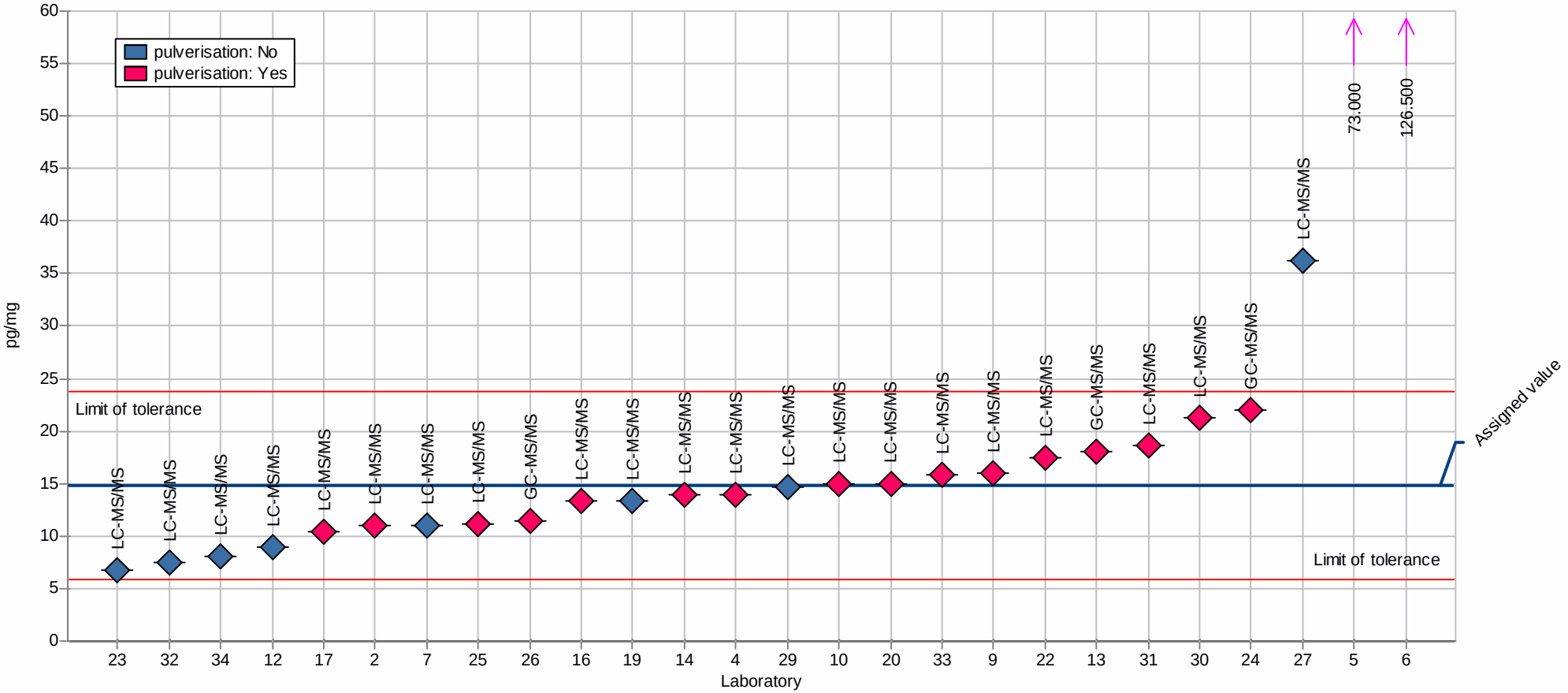
Assigned value:	29.321 pg/ mg (Empirical value)
Target s.d.:	7.978 pg/ mg (Horwitz function)
Rel. target s.d.:	27.21%
Reproducibility s.d.:	9.313 pg/ mg
Rel. reproducibility s.d.:	31.76%
Range of tolerance:	13.364 - 45.277 pg/ mg (|Z-Score| <= 2.000)



Assigned value for proficiency assessment: Mean of all participants

Sample:	HEtG 16/ 1-B
Measurand:	EtG
Statistical method:	ISO 5725-5
No. of laboratories:	26
No. of measurement values:	26

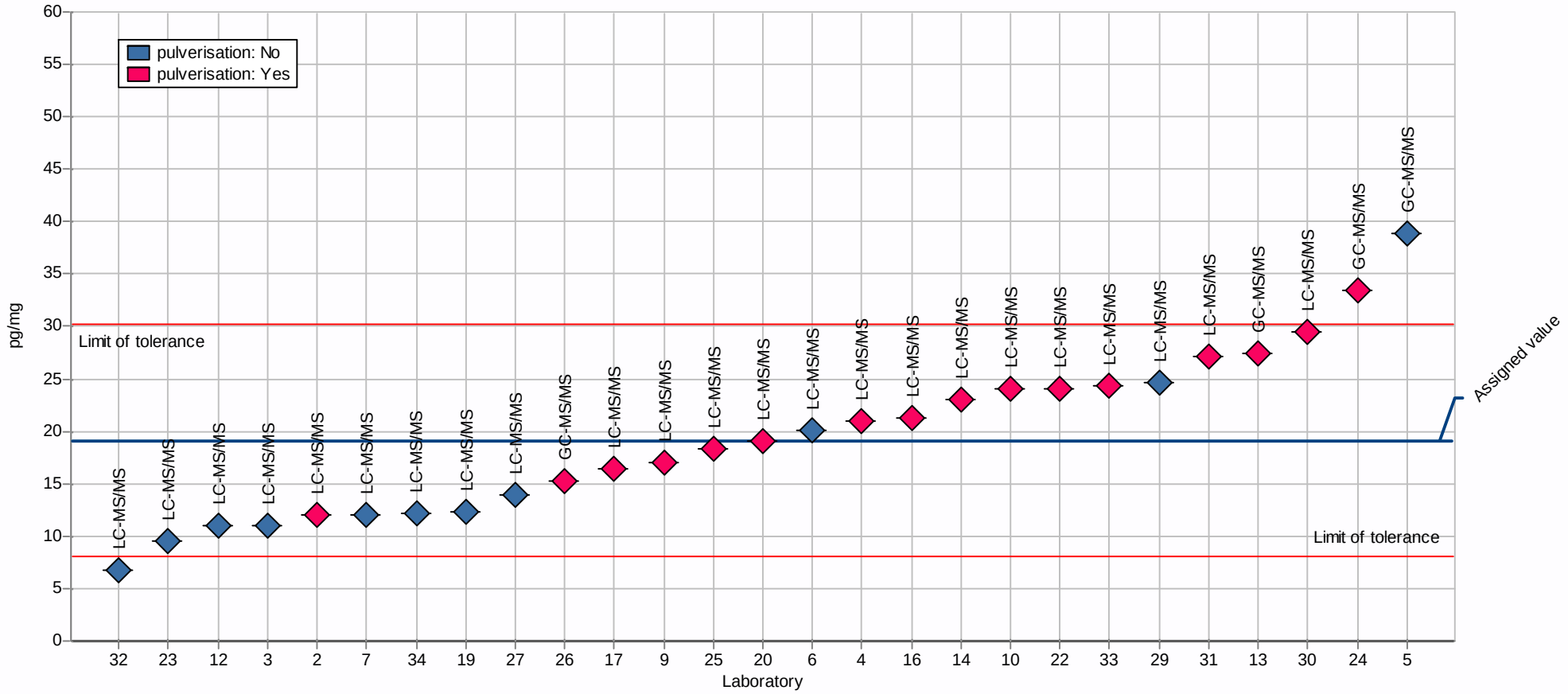
Assigned value:	14.793 pg/ mg (Empirical value)
Target s.d.:	4.462 pg/ mg (Horwitz function)
Rel. target s.d.:	30.16%
Reproducibility s.d.:	5.629 pg/ mg
Rel. reproducibility s.d.:	38.05%
Range of tolerance:	5.869 - 23.716 pg/ mg (|Z-Score| <= 2.000)



Assigned value for proficiency assessment: Mean of all participants

Sample:	HEtG 16/ 1-C
Measurand:	EtG
Statistical method:	ISO 5725-5
No. of laboratories:	27
No. of measurement values:	27

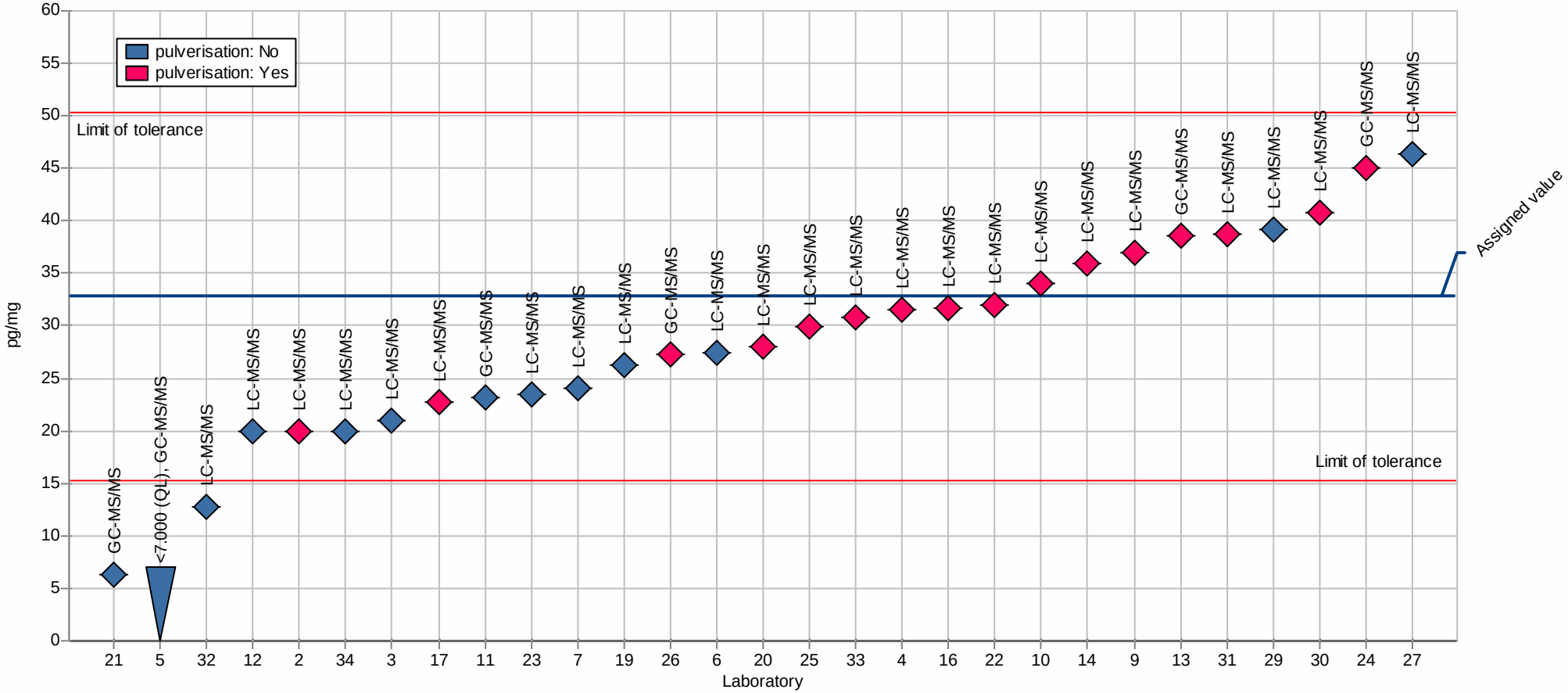
Assigned value:	19.104 pg/ mg (Empirical value)
Target s.d.:	5.544 pg/ mg (Horwitz function)
Rel. target s.d.:	29.02%
Reproducibility s.d.:	7.927 pg/ mg
Rel. reproducibility s.d.:	41.50%
Range of tolerance:	8.015 - 30.193 pg/ mg (|Z-Score| <= 2.000)



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

Sample:	HEtG 16/ 1-A
Measurand:	EtG
Statistical method:	ISO 5725-5
No. of laboratories:	28
No. of measurement values:	28

Assigned value:	32.793 pg/ mg (Reference value)
Target s.d.:	8.774 pg/ mg (Horwitz function)
Rel. target s.d.:	26.76%
Reproducibility s.d.:	9.313 pg/ mg
Rel. reproducibility s.d.:	28.40%
Range of tolerance:	15.245 - 50.341 pg/ mg (|Z-Score| <= 2.000)

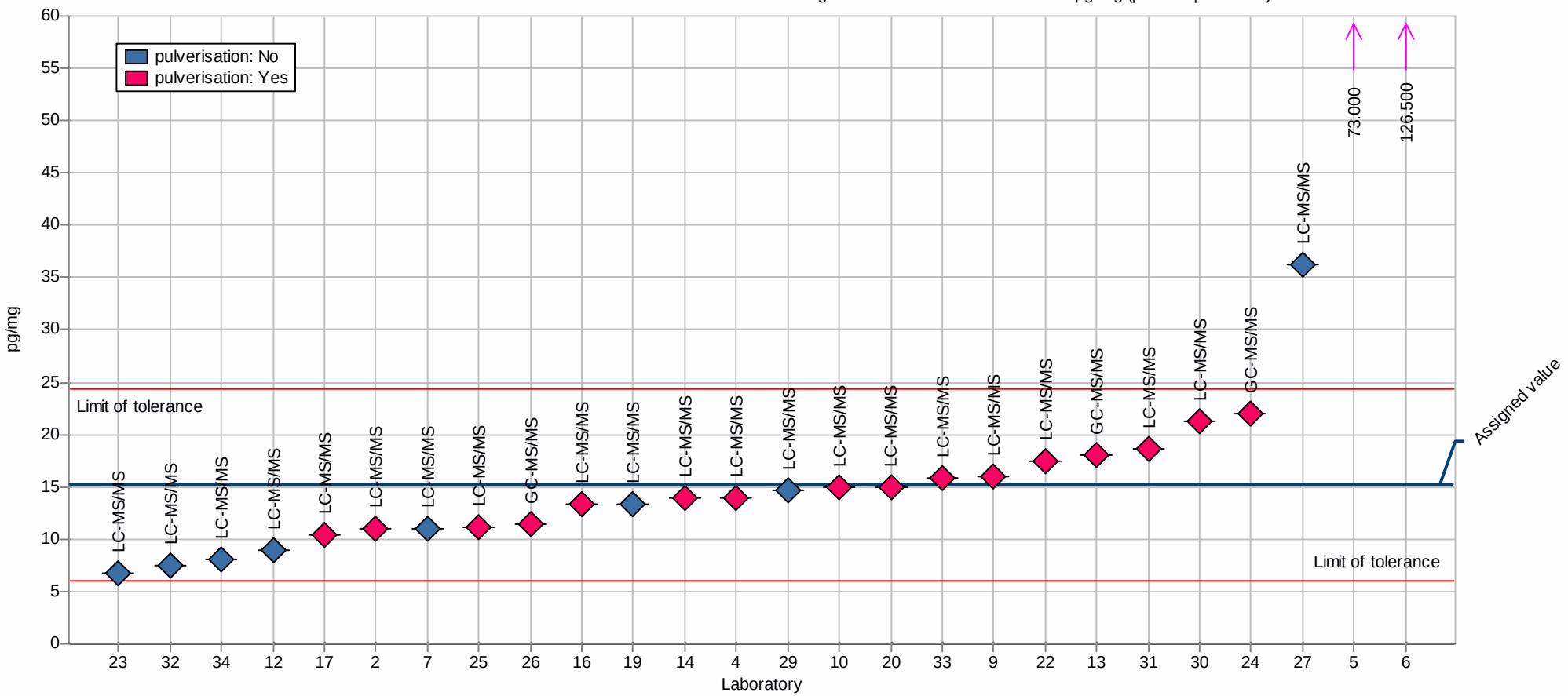


PROLab Plus

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

Sample:	HEtG 16/ 1-B
Measurand:	EtG
Statistical method:	ISO 5725-5
No. of laboratories:	26
No. of measurement values:	26

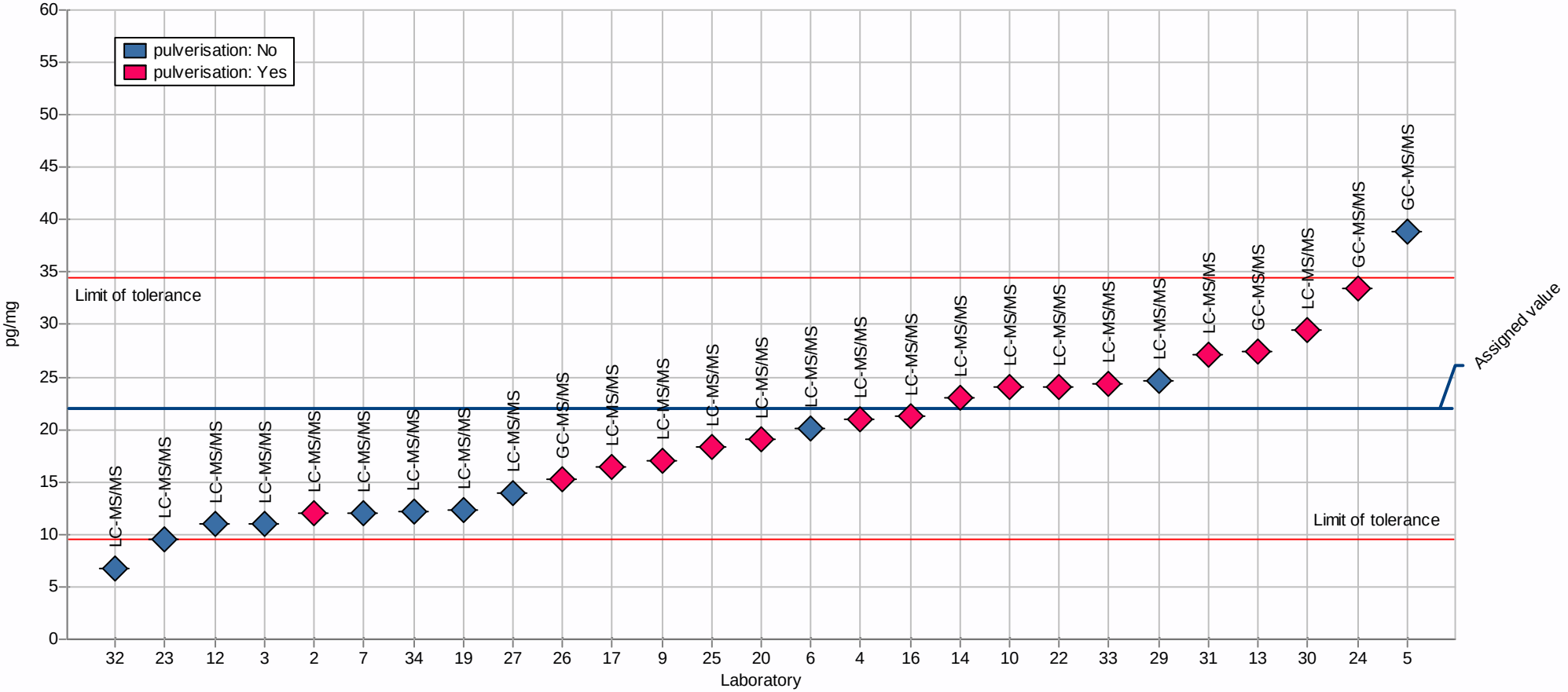
Assigned value:	15.190 pg/ mg (Reference value)
Target s.d.:	4.563 pg/ mg (Horwitz function)
Rel. target s.d.:	30.04%
Reproducibility s.d.:	5.629 pg/ mg
Rel. reproducibility s.d.:	37.05%
Range of tolerance:	6.064 - 24.316 pg/ mg (|Z-Score| <= 2.000)



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

Sample:	HEtG 16/ 1-C
Measurand:	EtG
Statistical method:	ISO 5725-5
No. of laboratories:	27
No. of measurement values:	27

Assigned value:	21.986 pg/ mg (Reference value)
Target s.d.:	6.247 pg/ mg (Horwitz function)
Rel. target s.d.:	28.41%
Reproducibility s.d.:	7.927 pg/ mg
Rel. reproducibility s.d.:	36.06%
Range of tolerance:	9.491 - 34.481 pg/ mg (|Z-Score| <= 2.000)



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