

**Results of Proficiency Test
Free Formaldehyde in textile
October 2009**

Organised by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

Author: Ing. R.J. Starink
Correctors: Dr. R.G. Visser & Ing. N. Boelhouwer
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1 INTRODUCTION

Since the 1990's, many countries have adopted environmental standards and requirements restricting the use of harmful chemicals in the production of textiles and clothing. Laws and regulations impose some of these standards and requirements. In addition to mandatory environmental standards and requirements for textiles, there are some Ecolabelling schemes imposing environmental requirements for textile products on a voluntary basis. Well known programs are for instance Milieukeur (the Netherlands), Öko-Tex Standard 100 (Germany) and Thai Green Label (Thailand).

Since several years, the Institute for Interlaboratory Studies (iis) organises a proficiency scheme for Free Formaldehyde in textile. Also, this year this scheme is part of the proficiency testing program 2009/2010.

In this international interlaboratory study 94 Laboratories in 25 different countries participated. See appendix 3 for a list of participants in (alphabetical) country order. In this report, the results of this proficiency test are presented and discussed.

2 SET UP

The Institute for Interlaboratory Studies in Spijkensisse was the organiser of this proficiency test. Sample preparation and analyses of fit for use and homogeneity were subcontracted. In this Proficiency Test, it was decided to use two different samples (#0981 and #0982, each approx. 3 grams) which were treated to find two different concentration levels of Free Formaldehyde. Participants were requested to report results with one extra figure. These unrounded results were preferably used for the statistical evaluations.

2.1 QUALITY SYSTEM

The Institute for Interlaboratory Studies in Spijkensisse, the Netherlands, has implemented a quality system based on ISO guide 43 and ILAC-G13:2007. This ensures 100% confidentiality of participant's data. Feedback from the participants on the reported data is encouraged and customer's satisfaction is measured on regular basis by sending out questionnaires.

2.2 PROTOCOL

The protocol followed in the organisation of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of November 2008 (iis-protocol, version 3.1).

2.3 CONFIDENTIALITY STATEMENT

All data present in this report must be regarded as confidential and for use by the participating companies only. Disclosure of the information in this report is only allowed by means of the entire report. Use of the contents of this report for third parties is only allowed by written permission of the Institute of Interlaboratory Studies. Disclosure of the identity of one or more of the participating companies will be done only after receipt of a written agreement of the companies involved.

2.4 SAMPLES

The two textile samples, a Navy Blue fabric (sample #0981) and a Pink fabric (sample #0982) were each well mixed and divided over 114 subsamples of approx. 3 grams. The samples were labelled and tested for homogeneity on randomly selected samples. The homogeneities of all subsamples were checked by determination of Free Formaldehyde in accordance with ISO14184-1:94 on randomly selected samples. See the following tables for the test results.

Navy Blue Fabric Textile	Free Formaldehyde in mg/kg
Sample #0981-1	123.3
Sample #0981-2	124.9
Sample #0981-3	124.5
Sample #0981-4	125.2
Sample #0981-5	123.4

table 1: homogeneity test of subsamples #0981

Pink Fabric Textile	Free Formaldehyde in mg/kg
Sample #0982-1	31.9
Sample #0982-2	31.8
Sample #0982-3	31.8
Sample #0982-4	31.8
Sample #0982-5	31.8

table 2: homogeneity test of subsamples #0982

From the above results of the homogeneity test, the repeatabilities were calculated and compared with 0.3 times the corresponding reproducibility of the reference method in agreement with the procedure of ISO 13528, Annex B2 in the next table:

	Free Formaldehyde in #0981	Free Formaldehyde in #0982
r (observed)	2.4	0.2
reference method	Horwitz	Horwitz
0.3 x R (reference method)	8.1	2.5

Table 3: : repeatabilities of subsamples #0981 and #0982

The calculated repeatabilities are both in good agreement with the estimated targets, calculated using the Horwitz equation. Therefore, homogeneity of all subsamples was assumed.

In total approx. 3 grams of each of the samples, #0981 and #0982 were sent to the participating laboratories on October 7, 2009.

2.5 ANALYSES

The participants were asked to determine on samples #0981 and #0982 the concentrations of Free Formaldehyde with the analytical procedure that is routinely used in the laboratory. To get comparable results, detailed report forms were sent together with each set of samples. On the report form the requested Free Formaldehyde concentration, including the units and some questions about the analytical details, were pre-printed. Also a letter of instructions was sent along.

3 RESULTS

During four weeks after sample despatch, the results of the individual laboratories were gathered. The original data are tabulated in the appendices of this report. The laboratories are presented by their code numbers.

Directly after the deadline, a reminder fax was sent to those laboratories that had not yet reported. Shortly after the deadline, the available results were screened for suspect data. A result was called suspect in case the Huber Elimination Rule (a robust outlier test, see lit.5) found it to be an outlier. The laboratories that produced these suspect data were asked to check the results. Additional or corrected data are placed under 'Remarks' in the result tables in appendix 1. A list of abbreviations used in the tables can be found in appendix 4.

3.1 STATISTICS

Statistical calculations were performed as described in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of November 2008 (iis-protocol, version 3.1)

For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded results. Results reported as '<...' or '>...' were not used in the statistical evaluation.

Before further calculations, the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test. In the case of an abnormal distribution, the statistical evaluation should be used with care.

According to ISO 5725 (1986 and 1994, lit.7 and 8) the original results per determination were submitted subsequently to Dixon's and Grubbs' outlier tests. Outliers are marked by D(0.01) for the Dixon's test, by G(0.01) or DG(0.01) for the Grubbs' test. Stragglers are marked by D(0.05) for the Dixon's test, by G(0.05) or DG(0.05) for the Grubbs' test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

Finally, the reproducibilities were calculated from the standard deviations by multiplying them with a factor of 2.8.

3.2 GRAPHICS

In order to visualise the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one determination (see appendix 1). On the Y-axis the reported analysis results are plotted. The corresponding laboratory numbers are under the X-axis. The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected standard. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle. Furthermore, Kernel Density Graphs were made. This method is producing a smooth density approximation to a set of data that avoids some problems associated with histograms (see appendix 4; nr.14 and 15).

3.3 Z-SCORES

To evaluate the performance of the individual participating laboratories the z-scores were calculated.

In order to be able to have an objective evaluation of the performance of the individual participants, it was decided to evaluate this performance against the literature requirements. Therefore, the z-scores were calculated using a target standard deviation. This target standard deviation was calculated from the literature reproducibility by division with 2.8.

The $Z_{(target)}$ -scores were calculated according to:

$$Z_{(target)} = (\text{individual result} - \text{average of proficiency test}) / \text{target standard deviation}$$

The $Z_{(target)}$ -scores are listed in the result tables in appendix 1.

Absolute values for $z < 2$ are very common and absolute values for $z > 3$ are very rare. The usual interpretation of z-scores is as follows:

- $|z| < 1$ good
- $1 < |z| < 2$ satisfactory
- $2 < |z| < 3$ questionable
- $3 < |z|$ unsatisfactory

4 EVALUATION

During the execution of this proficiency test no problems occurred with the delivery of the samples.

Two laboratories did not report any results and eight laboratories reported results after the final reporting date.

Finally, the 92 reporting laboratories send in, in total 184 numerical results. Observed were 14 statistical outlying results, which is 7.6% of the numerical results. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

A not normal distribution was found for sample #0982 and therefore the statistical evaluation for this sample should be used with care.

Due to the lack of precision data in the relevant test methods for the determination of Free Formaldehyde, the z-scores and the calculated reproducibilities were compared with the reproducibilities estimated by the Horwitz equation (see Appendix 4).

4.1 EVALUATION PER SAMPLE

In this section, the samples #0981 and #0982 are discussed. All statistical results reported on the textile samples are summarised in appendix 1.

Sample #0981: At this high concentration level (173 mg/kg) this determination is problematic for this sample. Eight statistical outliers were observed. The calculated reproducibility is, after rejection of the statistical outliers, not in agreement with the estimated reproducibility calculated using the Horwitz equation.

Sample #0982: At this concentration level (76 mg/kg) this determination is problematic for this sample. Six statistical outliers were observed. The calculated reproducibility is, after rejection of the statistical outliers, not in agreement with the estimated reproducibility calculated using the Horwitz equation.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the calculated reproducibilities using the Horwitz equation and the reproducibilities as found for the group of participating laboratories. The number of significant results, the average results, the calculated reproducibilities (standard deviation*2.8) and the target reproducibilities (Horwitz equation), are compared in the next table.

Parameter	unit	n	average	2.8 * sd	R (observed)
Free Formaldehyde #0981	mg/kg	84	173.1	42.3	35.7
Free Formaldehyde #0982	mg/kg	86	76.5	25.5	17.8

table 4: reproducibilities of textile samples #0981 and #0982

From the above tables it can be concluded that, without statistical calculations, the group of participating laboratories have difficulties with the analysis when compared with the strict target results calculated with the Horwitz equation. See also the discussions in paragraphs 4.1 and 6.

5 COMPARISON WITH THE PREVIOUS PROFICIENCY TESTS

The observed spreads, which were found in the results of the samples Free Formaldehyde during the present round, are about the same as the spread as observed in previous rounds (see next table).

Parameter	October 2009	October 2008	November 2007	November 2006	November 2005
Free Formaldehyde	24-33%	19-25-42%	24-25%	27-31%	28-43%

table 6: Relative reproducibilities of Free Formaldehyde

6 DISCUSSION

When the results of this interlaboratory study were compared to the Ecolabelling Standards and Requirements for Textiles in EU (table 7), it could be noticed that some participants would make different decisions about the acceptability of the textiles for the determined parameters, to the majority of the group.

Ecolabel	EU-adult clothes	EU-baby clothes	Öko-Tex 103 non skin contact	Öko-Tex 103 direct skin contact	Öko-Tex 106 baby clothes
Free Formaldehyde in mg/kg	75	30	300	75	20

table 7: Ecolabelling Standards and Requirements for Textiles in EU

The method for determination of the Free Formaldehyde is specified in the Standards of the Ecolabelling Institutes.

It should be noticed that ISO14184-1 corresponds to the Japanese method specified in the Japanese LAW 112 and is described in the Japanese Standard JIS L1096.

Three laboratories would reject sample #0981 for all categories (>300 mg/kg). All other laboratories would accept sample #0981 only for the category "Öko-Tex 103 non-skin contact" (>20mg/kg), according to the "Ecolabelling Standards and Requirements for Textile in Europe".

Sample #0982 would be rejected by 67% of the group for the category "EU-adult clothes" and "Öko-Tex 103 direct skin contact" (>75 mg/kg) according to the "Ecolabelling Standards and Requirements for Textile in Europe".

General

The Free Formaldehyde content was determined at two different levels. The participants were requested to provide us some additional details for the determination of Free Formaldehyde (see appendix 2). One may conclude that the date of testing has no influence on the test result.

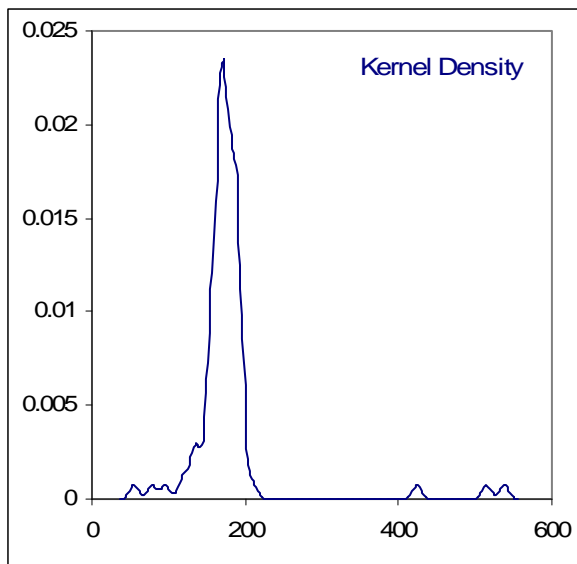
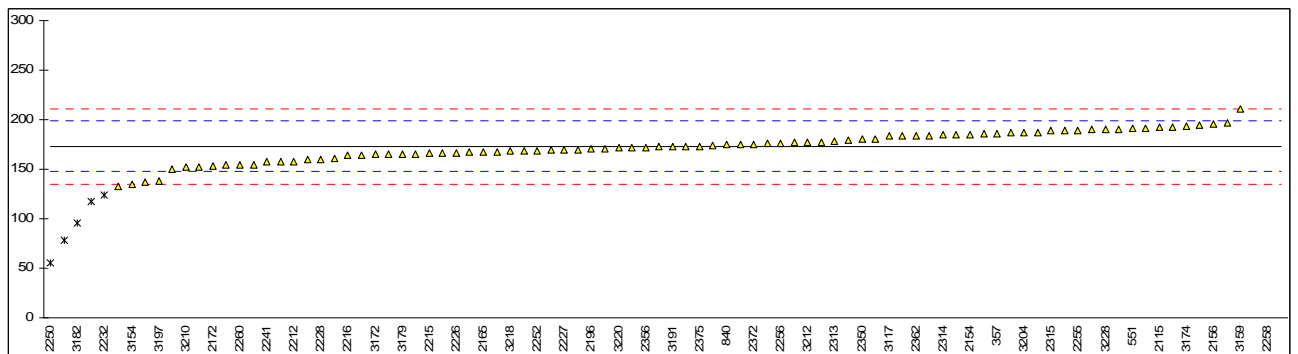
The spreads observed in this interlaboratory study are not caused by just one critical point in the analysis. Consequently, the reproducibilities cannot be improved by only one change in the analysis. Each laboratory has to evaluate its performance in this study and make decisions about necessary corrective actions. Therefore, participation on a regular basis in this scheme could be helpful to improve the performance and thus raise of the quality of the analytical results.

APPENDIX 1**Determination of Free Formaldehyde on sample #0981; results in mg/kg**

lab	method	value	mark	z(target)	remarks
110		----		----	
357	ISO14184-1	185.6		0.98	
551	ISO14184	191.4		1.44	
840	ISO14184-1	174.5		0.11	
1649	LAW112	197		1.88	
2102	In house	137.2		-2.81	
2115	JIS L1041	192.3		1.51	
2117	ISO14184-1	171.2		-0.15	
2129	ISO14184	154.6		-1.45	
2132	ISO14184-1	190.7		1.38	
2137	ISO14184-1	184.2		0.87	
2154	ISO14184-1	185.2		0.95	
2156	ISO14184-1	195.6		1.77	
2165	ISO14184	167.4		-0.45	
2172	ISO14184-1	152.9		-1.58	
2184	ISO14184-1	184.6		0.90	
2190	ISO14184	424	G(0.01)	19.68	
2196	ISO14184-1	170.4		-0.21	
2197	ISO14184-1	78.05	G(0.01)	-7.45	
2212	JIS L1041	158.1		-1.17	
2215	JIS B	166		-0.56	
2216	JIS L 1041	163.6		-0.74	
2219	ISO14184-1	177.24		0.33	
2226	ISO14184-1	166.6		-0.51	
2227	JIS LAW 112	169.7		-0.26	
2228	ISO14184-1	159.9		-1.03	
2232	ISO14184	123.6	DG(0.05)	-3.88	
2236	ISO14184-1	158		-1.18	
2241	ISO14184-1	157.4		-1.23	
2246	ISO14184-1	165.4		-0.60	
2250	ISO14184	54.9	G(0.01)	-9.27	
2252	ISO14184-1	168.9		-0.33	
2255	ISO14184-1	189.03		1.25	
2256	ISO14184-1	176.4		0.26	
2258	AATCC112	514.53	G(0.01)	26.78	
2260	ISO14184-1	154.4		-1.46	
2310	ISO14184-1	176		0.23	
2311	ISO14184-1	183.7		0.83	
2313	ISO14184-1	178.2		0.40	
2314	ISO14184-1	184.47		0.89	
2315	ISO14184-1	188.9		1.24	
2350	ISO14184	179.9		0.54	
2356	ISO14184-1	172.2		-0.07	
2358	ISO14184-1	195.1		1.73	
2360	ISO14184-1	150.4		-1.78	
2362	ISO14184-1	184		0.86	
2363	ISO14184-1	190.4		1.36	
2364	ISO14184-1	191.5		1.45	
2365	ISO14184-1	171.0		-0.16	
2366	ISO14184	177.0		0.31	
2367	ISO14184-1	189		1.25	
2368	ISO14184-1	170.0		-0.24	
2370	ISO14184-1	173		-0.01	
2372	ISO14184-1	175.3		0.17	
2375	ISO14184	173.2		0.01	
2379	ISO14184-1	172.5		-0.05	
2380	ISO14184-1	185.48	C	0.97	First reported 189.03
2386	ISO14184	180		0.54	
2390	ISO14184-1	192.6		1.53	
3104	ISO14184-1	169.5929		-0.27	
3110	ISO14184-1	164		-0.71	
3116	ISO14184-1	173.68		0.05	
3117	ISO14184-1	183.3		0.80	
3134	ISO14184-1	538	G(0.01)	28.62	
3153	ISO14184	159.7		-1.05	
3154	ISO14184	135		-2.99	
3159	ISO14184-1	210.4		2.93	
3166	ISO14184-1	187.5		1.13	
3167	ISO14184	132.9		-3.15	
3172	ISO14184-1	164.8		-0.65	
3174	ISO14184-1	193.45		1.60	
3176	ISO14184-1	164.88		-0.64	
3179	ISO14184-1	165		-0.63	
3182	ISO14184-1	95.8	G(0.01)	-6.06	
3185	ISO14184-1	160.9		-0.96	
3191	ISO14184-1	172.9		-0.01	

3197	ISO14184-1	137.9	-2.76	
3199	ISO14184-1	186.6	1.06	
3200	ISO14184-1	154.0	-1.50	
3204	LFGB 82.02-1	187.4	1.12	
3207	JIS L 1041	167.39	-0.45	
3208	LFGB 82.02-1	117.11	DG(0.05)	-4.39
3209	ISO14184-1	175.2	0.17	
3210	EN14184-1	151.9	-1.66	
3212	ISO14184-1	177.24	0.33	
3216	ISO14184-1	179.1649	0.48	
3218	ISO14184-1	168.2	-0.38	
3220	ISO14184-1	171.2	-0.15	
3226	ISO14184-1	166.0	-0.56	
3228	ISO14184-1	190.5	1.37	
3237	ISO14184-1	152	-1.65	
3246	ISO14184-1	168.7	-0.34	
3248	ISO14184	167.7	-0.42	
8005	-----	-----	-----	

normality OK
n 84
outliers 8
mean (n) 173.08
st.dev. (n) 15.099
R(calc.) 42.28
R(Horwitz) 35.70

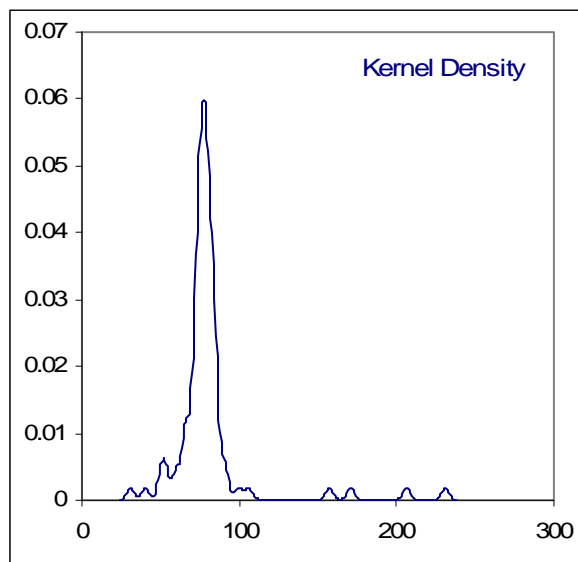
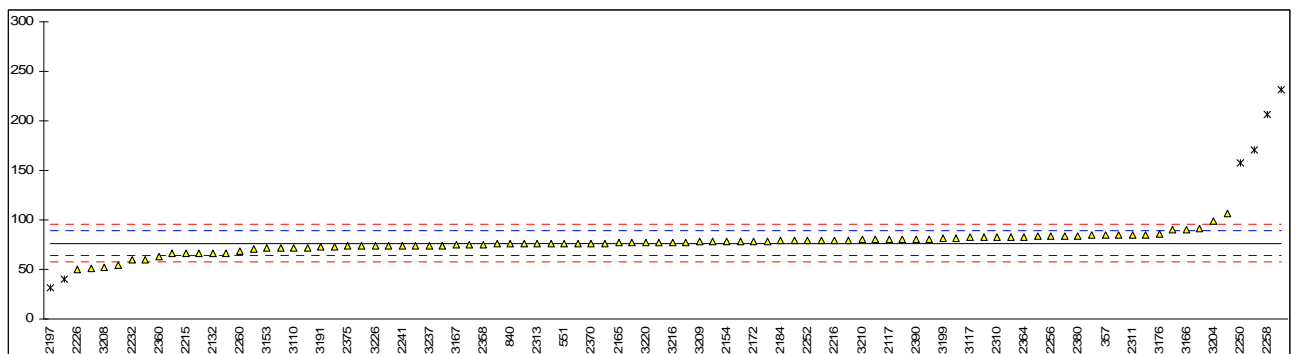


Determination of Free Formaldehyde on sample #0982; results in mg/kg

lab	method	value	mark	z(targ)	remarks
110		-----		-----	
357	ISO14184-1	84.3		1.23	
551	ISO14184	76.3		-0.03	
840	ISO14184-1	75.9		-0.09	
1649	LAW112	106		4.63	
2102	In house	73.5		-0.47	
2115	UNI14184-1	76.2		-0.04	
2117	ISO14184-1	79.9		0.54	
2129	ISO14184	66.0		-1.65	
2132	ISO14184-1	66.1		-1.63	
2137	ISO14184-1	81.3		0.76	
2154	ISO14184-1	78.0		0.24	
2156	ISO14184-1	84.3		1.23	
2165	ISO14184	76.9		0.07	
2172	ISO14184-1	78.8		0.36	
2184	ISO14184-1	78.9		0.38	
2190	ISO14184	171	G(0.01)	14.84	
2196	ISO14184-1	78.8		0.36	
2197	ISO14184-1	31.0	G(0.01)	-7.14	
2212	JIS L1041	72.0		-0.70	
2215	JIS B	66		-1.65	
2216	JIS L 1041	79.6		0.49	
2219	ISO14184-1	79.62		0.49	
2226	ISO14184-1	49.8		-4.19	
2227	JIS LAW 112	71.9		-0.72	
2228	ISO14184-1	65.9		-1.66	
2232	ISO14184	59.3		-2.70	
2236	ISO14184-1	51.6		-3.91	
2241	ISO14184-1	73.7		-0.44	
2246	ISO14184-1	78.9		0.38	
2250	ISO14184	157.2	G(0.01)	12.67	
2252	ISO14184-1	79.2		0.43	
2255	ISO14184-1	90.50		2.20	
2256	ISO14184-1	83.6		1.12	
2258	AATCC112	206.28	G(0.01)	20.37	
2260	ISO14184-1	68.4		-1.27	
2310	ISO14184-1	82.5		0.94	
2311	ISO14184-1	84.5		1.26	
2313	ISO14184-1	76.2		-0.04	
2314	ISO14184-1	82.12		0.89	
2315	ISO14184-1	80.9		0.69	
2350	ISO14184	76.6		0.02	
2356	ISO14184-1	74.2		-0.36	
2358	ISO14184-1	75.1		-0.22	
2360	ISO14184-1	62.7		-2.16	
2362	ISO14184-1	76		-0.08	
2363	ISO14184-1	84.0		1.18	
2364	ISO14184-1	83.0		1.02	
2365	ISO14184-1	76.4		-0.01	
2366	ISO14184	79.9		0.54	
2367	ISO14184-1	80		0.55	
2368	ISO14184-1	73.2		-0.52	
2370	ISO14184-1	76.5		0.00	
2372	ISO14184-1	79.57		0.48	
2375	ISO14184	73.4		-0.48	
2379	ISO14184-1	73.8		-0.42	
2380	ISO14184-1	84.04	C	1.19	First reported 90.50
2386	ISO14184	78		0.24	
2390	ISO14184-1	80.7		0.66	
3104	ISO14184-1	70.7926		-0.89	
3110	ISO14184-1	72		-0.70	
3116	ISO14184-1	82.66		0.97	
3117	ISO14184-1	82.1		0.88	
3134	ISO14184-1	231	G(0.01)	24.26	
3153	ISO14184	71.5		-0.78	
3154	ISO14184	54		-3.53	
3159	ISO14184-1	90.9		2.26	
3166	ISO14184-1	90.7		2.23	
3167	ISO14184	74.9		-0.25	
3172	ISO14184-1	77.3		0.13	
3174	JIS L1041	84.29		1.23	
3176	ISO14184-1	85.68		1.44	
3179	ISO14184-1	75		-0.23	
3182	ISO14184-1	40.4	G(0.05)	-5.66	
3185	ISO14184-1	75.7		-0.12	
3191	ISO14184-1	72.7		-0.59	

3197	ISO14184-1	66.3	-1.60
3199	ISO14184-1	81.2	0.74
3200	ISO14184-1	59.7	-2.63
3204	LFGB 82.02-1	99.4	3.60
3207	JIS L 1041	77.06	0.09
3208	LFGB 82.02-1	51.72	-3.89
3209	ISO14184-1	77.8	0.21
3210	EN14184-1	79.9	0.54
3212	ISO14184-1	78.39	0.30
3216	ISO14184-1	77.39	0.14
3218	ISO14184-1	83.3	1.07
3220	ISO14184-1	77.2	0.11
3226	ISO14184-1	73.4	-0.48
3228	ISO14184-1	84.9	1.32
3237	ISO14184-1	74	-0.39
3246	ISO14184-1	77.6	0.18
3248	ISO14184	73.4	-0.48
8005		-----	-----

normality	not OK
n	86
outliers	6
mean (n)	76.48
st.dev. (n)	9.101
R(calc.)	25.48
R(Horwitz)	17.84



APPENDIX 2

Additional testing details

Lab	Date of testing	Rec.corr.	Remarks
110	-	-	-
357	28-oct-2009	no	-
551	27-oct-2009	yes	-
840	20-oct-2009	no	-
1649	20-oct-2009	no	-
2102	5-oct-2009	no	CHE01-WVYY3 same as ISO14184
2115	5-nov-2009	no	-
2117	20-oct-2009	no	-
2129	13-oct-2009	no	-
2132	28-oct-2009	no	-
2137	2-nov-2009	no	-
2154	4-nov-2009	no	-
2156	21-oct-2009	no	-
2165	2-nov-2009	no	-
2172	-	-	-
2184	13-oct-2009	no	-
2190	2-nov-2009	no	-
2196	28-oct-2009	no	-
2197	4-nov-2009	no	-
2212	28-oct-2009	no	-
2215	14-oct-2009	no	-
2216	29-oct-2009	No	-
2219	28-oct-2009	no	-
2226	3-nov-2009	no	-
2227	19-oct-2009	no	-
2228	19-oct-2009	no	-
2232	29-oct-2009	no	-
2236	4-nov-2009	no	-
2241	21-oct-2009	no	-
2246	-	no	-
2250	4-nov-2009	no	-
2252	16-oct-2009	no	-
2255	15-oct-2009	no	-
2256	19-oct-2009	no	-
2258	21-oct-2009	yes	-
2260	-	no	-
2310	14-oct-2009	no	-
2311	-	no	-
2313	2-nov-2009	no	-
2314	3-nov-2009	no	-
2315	28-oct-2009	no	-
2350	26-oct-2009	no	-
2356	2-nov-2009	no	-
2358	28-oct-2009	no	-
2360	4-nov-2009	no	-
2362	-	no	-
2363	-	no	-
2364	22-oct-2009	no	-
2365	16-oct-2009	no	-
2366	-	no	-
2367	30-oct-2009	no	-
2368	19-oct-2009	no	-
2370	20-oct-2009	no	-
2372	15-oct-2009	no	-
2375	-	no	-
2379	21-oct-2009	no	-
2380	15-oct-2009	no	-
2386	6-nov-2009	no	-
2390	29-oct-2009	no	-
3104	29-oct-2009	no	-
3110	29-oct-2009	no	-
3116	-	no	-
3117	-	no	-
3134	3-nov-2009	no	-
3153	29-oct-2009	no	-
3154	27-oct-2009	no	-
3159	13-oct-2009	yes	-
3166	3-nov-2009	no	-
3167	3-nov-2009	no	-
3172	4-nov-2009	no	-
3174	16-oct-2009	yes	-
3176	12-oct-2009	no	-
3179	12-oct-2009	no	-
3182	3-nov-2009	no	-
3185	-	no	-

3191	3-nov-2009	no	-
3197	22-oct-2009	no	-
3199	3-nov-2009	no	-
3200	28-oct-2009	no	-
3204	5-nov-2009	no	-
3207	27-oct-2009	yes	-
3208	3-nov-2009	no	-
3209	21-oct-2009	no	-
3210	21-oct-2009	no	-
3212	20-oct-2009	no	-
3216	4-nov-2009	yes	-
3218	-	no	-
3220	12-oct-2009	no	-
3226	30-oct-2009	no	-
3228	-	no	-
3237	12-oct-2009	no	-
3246	14-oct-2009	no	-
3248	31-oct-2009	yes	-
8005	-	-	-

APPENDIX 3**Number of participants in alphabetical country order**

1 laboratory in	AUSTRIA
2 laboratories in	BANGLADESH
1 laboratory in	BELGIUM
1 laboratory in	BRASIL
2 laboratories in	FINLAND
2 laboratories in	FRANCE
8 laboratories in	GERMANY
2 laboratories in	GREECE
1 laboratory in	GUATEMALA
14 laboratories in	HONG KONG
6 laboratories in	INDIA
3 laboratories in	ITALY
2 laboratories in	KOREA
1 laboratory in	MALAYSIA
2 laboratories in	MEXICO
24 laboratories in	P.R. of CHINA
1 laboratory in	PAKISTAN
1 laboratory in	SINGAPORE
1 laboratory in	SPAIN
2 laboratories in	TAIWAN R.O.C.
4 laboratories in	THAILAND
1 laboratory in	THE NETHERLANDS
4 laboratories in	TURKEY
6 laboratories in	U.S.A.
2 laboratories in	VIETNAM

APPENDIX 4

Abbreviations:

C	= final result after checking of first reported suspect result
D(0.01)	= outlier in Dixon's outlier test
D(0.05)	= straggler in Dixon's outlier test
G(0.01)	= outlier in Grubbs' outlier test
G(0.05)	= straggler in Grubbs' outlier test
DG(0.01)	= outlier in Double Grubbs' outlier test
DG(0.05)	= straggler in Double Grubbs' outlier test
n.a.	= not applicable
n.d.	= not detected
W	= withdrawn

Literature:

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