



Proficiency test for dioxins and dioxin-like PCBs in fats

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RIKILT

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Summary

A proficiency test for dioxins and dioxin-like PCBs in fat was organized by RIKILT-Wageningen UR. This test provides an evaluation of the methods applied for quantification of dioxins and dioxin-like PCBs in fat by the laboratories. The proficiency test was organised according to ISO 17043.

For this test, four samples were prepared:

- Sunflower oil spiked with dioxins and PCBs (material 1).
- Sunflower oil mixed with contaminated fish oil (material 2).
- Sunflower oil mixed with contaminated chicken fat and spiked with 2,3,7,8-PCDF (material 3a).
- Sunflower oil mixed with contaminated chicken fat and spiked with non-dioxin like PCBs (material 3b).

Fifteen labs participated in the PT and all of them submitted results before the deadline. z-Scores were calculated for all 20 PCDD/F congeners (including PCD/F-TEQ upper bound, middle bound and lower bound) and 21 PCBs (including PCB-TEQ, upper bound, middle bound and lower bound). None of the participating laboratories showed optimal performance by quantifying all congeners and sum-TEQs correctly. However, twelve of the fifteen labs reported correct sum-TEQs for both PCDD/Fs and PCBs.

Wide ranges of results were reported in this PT: for more than 25% of the compound-material combinations the uncertainty of the assigned value exceeded $0.3\sigma_H$, indicating large variability in results.

It was concluded that various labs were not able to report dioxins and dioxin-like PCBs according to Commission Regulation (EC) No 152/2009. Deviations from this regulation were:

- No correction for moisture content.
- No (advise for) re-analysis after a non-compliant screening result.
- Uncorrect use of compliant or non-compliant for samples.

1 Introduction

Proficiency testing is conducted to provide laboratories with a powerful tool to evaluate and demonstrate the reliability of the data that are produced. Next to validation and accreditation, proficiency testing is an important requirement of the EU Additional Measures Directive 93/99/EEC [1] and is required by ISO 17025:2005 [2].

The aim of this proficiency study was to give laboratories the possibility to evaluate or demonstrate their competence for the analysis of dioxins and dioxin-like PCBs in fat of plant origin intended for use in animal feed. The analysis must be carried out according to Commission Regulation (EC) No 152/2009. The preparation of the materials, including the suitability testing of the materials and the evaluation of the quantitative results were carried out according to ISO 17043 [3].

2 Materials and methods

2.1 Sample preparation

Four samples were prepared for this test. They were prepared by either adding standard solutions of PCDD/Fs and/or dioxin-like PCBs (dl) or non-dioxin-like PCBs (ndl) or by adding contaminated fat, either fish or chicken fat to a sunflower oil basis (Table 1):

- Sunflower oil spiked with dioxins and PCBs (material 1).
- Sunflower oil mixed with contaminated fish oil (material 2).
- Sunflower oil mixed with contaminated chicken fat and spiked with 2,3,7,8-PCDF (material 3a).
- Sunflower oil mixed with contaminated chicken fat and spiked with six ndl PCBs (material 3b).

Table 1

Aimed spiking levels.

	Material 1	Material 2	Material 3a	Material 3b
dioxins in ng TEQ/kg	1.01	0.48	1.15	1.15
dl-PCBs in ng TEQ/kg	0.89	0.85	2.36	2.36
dioxins and dl-PCBs in ng TEQ/kg	1.90	1.33	3.40	3.40
ndl PCBs in µg/kg	15.0	7.76	-	36.51

These feed materials of plant origin were homogenized according to in-house standard operating procedures [5].

2.2 Sample identification

After homogenization, the sample materials were divided into sub-portions and stored in glass jars. Each contained 10 ml of sample. The samples for the participants were randomly selected and coded from 001 through 120. For each laboratory a sample set was prepared consisting of one randomly selected sample of material 1, 2 and 3a or 3b. Lab 12 received materials 1, 2, 3a and 3b. The codes of the samples belonging to each sample set are presented in Annex 1. Part of the remaining samples were used for homogeneity testing.

2.3 Participants

Fifteen European laboratories subscribed for participation in the proficiency test and reported within the deadline.

2.4 Homogeneity study

The homogeneity of the materials was tested according to The International Harmonized Protocol for Proficiency Testing of Analytical Laboratories [7] and ISO 13528 [8], taking into account the insights discussed by Thompson [9] regarding the Horwitz equation. With this procedure the between-sample standard deviation (s_s) and the within-sample standard deviation (s_w) are compared with the target standard deviation derived from the Horwitz equation (σ_H , §4.3). The method applied for homogeneity testing is considered suitable if $s_w < 0.5 \cdot \sigma_H$ [7] and a material is considered adequately homogeneous if $s_s < 0.3 \cdot \sigma_H$.

For the four materials PCB 138 and PCB 153 were selected to determine homogeneity. Ten randomly selected containers of materials 1 and 2 were analysed in duplicate for PCB 138 to determine the homogeneity of the materials. Materials 3a and 3b were analysed in duplicate for PCB 153. The results of the homogeneity study and their statistical evaluation are presented in Annex 2. All four materials demonstrated to be sufficiently homogeneous for use in the proficiency test.

2.5 Sample distribution and instructions

Each of the participating laboratories received a randomly assigned laboratory code (1 through 16). The sample sets with the corresponding number, consisting of three or four coded samples (Annex 1) were sent to the participating laboratories on February 25th 2013. Labs 1, 2, 4, 6, 8, 10, and 15 received materials 1, 2 and 3a, labs 3, 5, 7, 9, 11, 13 and 16 received materials 1, 2 and 3b and lab 12 received all four materials. The samples were accompanied by a letter (Annex 5) describing the requested analyses, an acknowledgement of receipt form and a results form.

The laboratories were asked to store the samples until analysis according to their own laboratory procedure. A single analysis according to EC/152/2009 of each sample was requested. The deadline for sending in the results was April 6th 2013, allowing the participants at least 5 weeks for the analysis. Two labs registered later and reported later. Whether the dioxin and/or dioxin-like PCBs or the ndl-PCB levels in the samples were compliant or non-compliant according to regulations was asked after the deadline.

Maximum levels of dioxins and/or PCBs are laid down in Directive 2002/32/EC of the European Parliament and of the council [6]. The upper bound levels in a feed (ingredient) sample expressed in ng TEQ/kg (12% moisture) are in compliance with this directive if the detected amount is below the maximum level with 95% certainty. Maximum levels are presented in Table 3. The measurement uncertainty has to be taken into account [14].

3 Applied method of analysis

An overview of the applied methods is presented in Annex 4. All applied high resolution mass spectrometers which worked with a resolution of 10,000. For the detection of PCDD/Fs nine labs applied GC-HRMS, four applied GC-MS/MS and one applied the CALUX assay. The amounts of fat equivalents injected on to the GC-column varied from 0.4 to 2.5 grams.

For the detection of PCBs, ten labs applied GC-HRMS, one lab applied GC-MS, one lab applied GC-MS/MS, one lab applied a combination of GC-HRMS and LRMS and one lab applied the CALUX assay. The amounts of fat equivalents injected on to the GC-column varied from 0.004 to 2.4 grams.

The lowest and highest limits of detection for PCDD/Fs varied from a factor 1.25 for 2,3,7,8-TCDD to a factor 40 for 1,2,3,4,6,7,8,9-OCDF (lowest LOD was <0.05 ng/kg, highest was <2 ng/kg).

The lowest and highest limits of detection for PCBs varied from a factor 2 for PCB 77 to a factor 500 for PCBs 28 and 180 (lowest LOD was <2 ng/kg, highest was 1000 ng/kg).

4 Statistical evaluation

For the evaluation of the quantitative results the assigned value, the uncertainty of the assigned value, a target standard deviation and z-scores were calculated. The statistical evaluation of the quantitative part of the study was carried out according to the International Harmonized Protocol for the Proficiency Testing of Analytical Laboratories [7], elaborated by ISO, IUPAC and AOAC and ISO 13528 [8] in combination with the insights published by the Analytical Methods Committee [11,12] regarding robust statistics.

4.1 Calculation of the assigned value (X)

The assigned value (X) was determined using robust statistics [8,11,12]. The advantage of robust statistics is that all values are taken into account: outlying observations are retained, but given less weight. Furthermore, it is not expected to receive normally distributed data in a proficiency test. When using robust statistics, the data does not have to be normally distributed in contrast to conventional outlier elimination methods.

The robust mean of the reported results of all participants, calculated from an iterative process that starts at the median of the reported results using a cut-off value depending on the number of results, was used as the assigned value [8,11]. The assigned value is therefore a consensus value.

4.2 Calculation of the uncertainty of the assigned value (u)

The uncertainty of the assigned value is calculated to determine the influence of this uncertainty on the evaluation of the laboratories. A high uncertainty of the assigned value will lead to a high uncertainty of the calculated participants z_a -scores. If the uncertainty of the assigned value and thus the uncertainty of the z_a -score is high, the evaluation could indicate unsatisfactory method performance without any cause within the laboratory. In other words, illegitimate conclusions could be drawn regarding the performance of the participating laboratories from the calculated z_a -scores if the uncertainty of the assigned value is not taken into account.

The uncertainty of the assigned value (the robust mean) is calculated from the estimation of the standard deviation of the assigned value and the number of values used for the calculation of the assigned value [8]:

$$u = 1.25 * \frac{\hat{\sigma}}{\sqrt{n}}$$

where:

- u = Uncertainty of the assigned value;
- n = Number of values used to calculate the assigned value;
- $\hat{\sigma}$ = The estimate of the standard deviation of the assigned value resulting from robust statistics.

According to ISO 13528 [8] the uncertainty of the assigned value (u) is negligible and therefore does not have to be included in the statistical evaluation if:

$$u \leq 0.3\sigma_H$$

where:

u = The uncertainty of the assigned value;

σ_H = Target standard deviation (§4.3).

In case the uncertainty of the assigned value does not comply with this criterion, the uncertainty of the assigned value should be taken into account when evaluating the performance of the participants regarding the accuracy (§4.4).

4.3 Calculation of the target standard deviation (σ_H)

The coefficient of variation for the repeated analysis of a reference or fortified material under reproducibility conditions, shall not exceed the level calculated by the Horwitz equation [4]. The Horwitz equation, $\sigma_H = 0.02c^{0.8495}$, presents a useful and widespread applied relation between the expected relative standard deviation of a singular analysis result under reproducibility conditions, and the concentration, c (g/g). It expresses inter-laboratory precision expected in inter-laboratory trials. Therefore, this relation is suitable for calculating the target standard deviation in proficiency tests. Thompson [7] demonstrated that the Horwitz equation is not applicable to the lower concentration range (<120 µg/kg) as well as to the higher concentration range (>138 g/kg). Therefore a complementary model is used:

For analyte concentrations <120 µg/kg:

$$\sigma_H = 0.22c$$

For analyte concentrations >138 g/kg:

$$\sigma_H = 0.01c^{0.5}$$

where:

σ_H = Expected standard deviation in inter-laboratory trials;

c = Concentration of the analyte (g/g).

4.4 Performance characteristics with regard to the accuracy

For illustrating the performance of the participating laboratories with regard to the accuracy a z_a -score is calculated. For the evaluation of the performance of the laboratories, ISO 13528 [8] is applied. According to these guidelines z_a -scores are classified as presented in Table 2.

Table 2

Classification of z_a -scores.

$ z_a \leq 2$	Satisfactory
$2 < z_a < 3$	Questionable
$ z_a \geq 3$	Unsatisfactory

If the calculated uncertainty of the assigned value complies with the criterion mentioned in §4.2, the uncertainty is negligible. In this case the accuracy z -score is calculated from:

$$z_a = \frac{\bar{X} - X}{\sigma_H} \quad \text{Equation I}$$

where:

z_a = Accuracy z-score;
 $\bar{X}$ = The result of the laboratory;
 X = Assigned value;
 σ_H = Target standard deviation.

However, if the uncertainty of the assigned value does not comply with the criterion mentioned in § 4.2, it could influence the evaluation of the laboratories. Although, according to ISO 13528 in this case no z-scores can be calculated if a consensus value is used as the assigned value, we feel that evaluation of the participating laboratories is of main importance justifying the participating laboratories' effort. Therefore in this case, the uncertainty is taken into account by calculating the accuracy z-score [8]:

$$z'_a = \frac{\bar{X} - X}{\sqrt{\sigma_H^2 + u^2}} \quad \text{Equation II}$$

where:

z'_a = Accuracy z-score taking into account the uncertainty of the assigned value;
 $\bar{X}$ = The result of the laboratory;
 X = Assigned value;
 σ_H = Target standard deviation;
 u = Uncertainty of the assigned value.

5 Results and discussion

Fifteen laboratories participated for participation in the proficiency test for dioxins and dioxin-like PCBs in fat. For statistical evaluation, the results which were reported with smaller than values ('<') were changed to the corresponding detection limits. Participants were asked to report according to the Commission Regulation 225/2012 [15]. Table 3 shows an overview of what should have been reported in accordance with Directive 2002/32/EC [6] regarding maximum levels and Commission regulation 277/2012 (amendment of 2002/32/EC) [13]. In this test material 1 would be regarded as non-compliant, material 2 as compliant but above action level, material 3a as non-compliant and 3b as non-compliant.

An overview of all results for each sum-total or congener is presented in Annex 5. A total of 123 results could be reported per participant, except for lab 12, which could report 164 results since it received four materials.

Extra information about the compliancy or non-compliancy of the samples was asked to the participants after the deadline (Table 4).

Table 3

In the ideal case the results below would have been reported for the feed materials of plant origin.

	Spiking level	Correction for 22 % measurent uncertainty	EU Maximum level*	EU Action Treshold*	Compliant / non-compliant
Material 1					
Dioxins in ng TEQ/kg	1.01	0.79	0.75	0.5	non-compliant
Dioxin-like PCBs in ng TEQ/kg	0.89	0.69	-	0.5	above action level
Dioxins and dioxin-like PCBs in ng TEQ/kg	1.90	1.48	1.25	-	non-compliant
Non dioxin-like PCBs in µg/kg	15.0	11.7	10	-	non-compliant
Material 2					
dioxins in ng TEQ/kg	0.48	0.37	0.75	0.5	compliant
Dioxin-like PCBs in ng TEQ/kg	0.85	0.66	-	0.5	above action level
Dioxins and dioxin-like PCBs in ng TEQ/kg	1.33	1.04	1.25	-	compliant
non dioxin-like PCBs in µg/kg	7.76	6.05	10	-	compliant
Material 3a					
Dioxins in ng TEQ/kg	1.15	0.90	0.75	0.5	non-compliant
Dioxin-like PCBs in ng TEQ/kg	2.36	1.84	-	0.5	above action level
Dioxins and dioxin-like PCBs in ng TEQ/kg	3.4	2.65	1.25	-	non-compliant
Non dioxin-like PCBs in µg/kg	-	-	10	-	compliant
Material 3b					
dioxins in ng TEQ/kg	1.15	0.90	0.75	0.5	non-compliant
Dioxin-like PCBs in ng TEQ/kg	2.36	1.84	-	0.5	above action level
Dioxins and dioxin-like PCBs in ng TEQ/kg	3.4	2.65	1.25	-	non-compliant
Non dioxin-like PCBs in µg/kg	36.5	28.5	10	-	non-compliant

* Assuming 100% vegetable oil.

Table 4

Compliant or non-compliant as reported by participants.

Lab-code	Material 1 Non-compliant	Material 2 Compliant	Material 3a Non-compliant	Material 3b Non-compliant	Remarks
1	Non-compliant	Non-compliant	Non-compliant		
2	Non-compliant	Compliant	Non-compliant		No correction for 12% moisture content.
3	Compliant	Compliant		Compliant	
4			No information		
5	Non-compliant	Non-compliant		Non-compliant	
6	Compliant for dioxins Compliant for sum dioxins and PDBs Non-compliant for sum ndl PCBs	Compliant for dioxins Compliant for sum dioxins and PDBs Compliant for sum ndl PCBs	Non-compliant for dioxins Non-compliant for sum dioxins and PCBs Compliant for non dioxin like PCBs		2002/32/EC
7	Compliant*	Compliant		Non-compliant: PCDD/F; sum PCDD/F + diPCB; sum ndl-PCB	Correction for 12% moisture content and measurement uncertainty taken into account * The levels of PCDD/F and sum ndl-PCBs are above the limit on basis of 12% water content but are slightly below the maximum level considering the uncertainty of measurement.
8	Non-compliant – the sum of ICES-6 is over the limit. The sample is also over the limit for both WHO-PCDD/F-TEQ and WHO-PCDD/F-PCB-TEQ, but could be below if measurement uncertainty is taken into account.	Compliant – but could be over limit for WHO- PCDD/F-PCB-TEQ if measurement uncertainty is included.	Non-compliant , over limit for both WHO-PCDD/F-TEQ and WHO-PCDD/F-PCB-TEQ		Correction for 12% moisture content.
9	Non-compliant	Non-compliant		Non-compliant	Action level of mixed animal fat for animal consumption
10	Non-compliant with maximum content for WHO-PCDD/F-TEQ and sum indicator PCBs	Non-compliant with action threshold for WHO-PCB-TEQ	Non-compliant with maximum content for WHO-PCDD/F-PCB-TEQ and WHO-PCDD/F-TEQ		No correction for 12% moisture content.
11	Non-compliant	Compliant		Non-compliant	No correction for 12% moisture content.
12	Non-compliant	Compliant , but above action limit DL-PCB	Non-compliant	Non-compliant	
13	Non-compliant	Compliant*		Non-compliant	EC 277/2012 * Under recognition of the measurement uncertainty no overstepping of the official MRL is detected, but the action level for dl-PCB is reached.
15	Compliant	Compliant	Compliant		
16	Non-compliant (sum NDL-PCBs)	Compliant		Non-compliant (sum dioxins + DL-PCBs) / (sum NDL-PCBs)	

A variety of results was reported for the compliancy/non-compliancy of the samples and some questions were asked. Material 1 (considered non-compliant in the ideal case) was assigned as compliant by three labs, non-compliant by ten labs and compliant (for dioxins and sum dioxins and PCBs) and non-compliant (for sum non dioxin-like (ndl) PCBs) by one lab. Material 2 (considered compliant in the ideal case) was assigned as compliant by ten labs and non-compliant by four labs. For material 3a (considered non-compliant in the ideal case) one lab reported this material as compliant, six as non-compliant and one as non-compliant (for dioxins and sum dioxins and PCBs) and compliant (for ndl-PCBs). Material 3b (considered non-compliant in the ideal case) was assigned compliant by one lab and non-compliant by six labs. Labs 2, 6, 8, 11, 12, 13 and 16 assigned all materials correctly as compliant or non-compliant.

Not all labs corrected for the moisture content as laid down in Commission Regulation no 152/2009 [14]. Also, in case CALUX assay, GC-MS or GC-MS/MS (screening techniques) were used in combination with non-compliant results, no lab suggested re-analysis with high-resolution mass spectrometry.

5.1 Totals PCDD/F-TEQ and PCB-TEQ

Table 5 shows the lowest and highest reported values for PCDD/Fs and Table 6 for PCBs.

Table 5

Lowest and highest reported concentrations for PCDD/Fs-TEQ ub, mb and lb.

Material	Upper, middle or lower bound	Lowest value (ng / kg)	Highest value (ng / kg)	Questionable or unsatisfactory z-scores	Remarks
1	ub	0.72 (lab 6)	1.21 (lab 9)		
	mb	0.72 (lab 6)	1.110720255 (lab 10)		
	lb	0.72 (lab 6)	1.11 (lab 11)		
2	ub	0.364 (lab 6)	7.958 (lab 4)	2 unsatisfactory results	uncertainty > $0.3\sigma_H$
	mb	0.303 (lab 15)	7.958 (lab 4)	1 unsatisfactory result	uncertainty > $0.3\sigma_H$
	lb	0.224 (lab 15)	7.958 (lab 4)	1 unsatisfactory result	uncertainty > $0.3\sigma_H$
3a	ub	0.923 (lab 6)	1.33 (lab 8)		
	mb	0.923 (lab 6)	1.33 (lab 8)		
	lb	0.923 (lab 6)	1.33 (lab 8)		
3b	ub	1.0126 (lab 3)	1.56 (lab 9)		
	mb	1.012 (lab 3)	1.36 (lab 11)		
	lb	1.0114 (lab 3)	1.36 (lab 11)		

* q = questionable result, u = unsatisfactory result.

For material 2 the uncertainty of the assigned exceeded $0.3\sigma_H$ and therefore the uncertainty was taken into account in the evaluation of the laboratories (equation II, §4.4). With respect to the accuracy four results were unsatisfactory ($|z| > 3$) (lab 4 3 times and lab 9 once), all related to material 2.

The uncertainty of the assigned did not exceed $0.3\sigma_H$ and therefore the uncertainty was not taken into account in the evaluation of the laboratories (equation I, §4.4). With respect to the accuracy eleven results were questionable ($2 < |z| < 3$) (lab 3 9 times and lab 9 twice).

Table 6

Lowest and highest reported concentrations for PCBs-TEQ, ub, mb and lb.

Material	Upper, middle or lower bound	Lowest value (ng / kg)	Highest value (ng / kg)	Questionable or unsatisfactory z-scores
1	ub	0.321 (lab 3)	0.99 (lab 4)	2 questionable results
	mb	0.321 (lab 3)	0.99 (lab 4)	1 questionable result
	lb	0.321 (lab 3)	0.99 (lab 4)	1 questionable result
2	ub	0.3784 (lab 3)	1.135 (lab 6)	1 questionable result
	mb	0.3632 (lab 3)	1.105 (lab 6)	1 questionable result
	lb	0.3481 (lab 3)	1.075 (lab 6)	1 questionable result
3a	ub	1.44 (lab 1)	2.501 (lab 4)	
	mb	1.44 (lab 1)	2.501 (lab 4)	
	lb	1.44 (lab 1)	2.501 (lab 4)	
3b	ub	0.77 (lab 9)	2.15 (lab 11)	2 questionable results
	mb	0.8188 (lab 3)	2.12 (lab 11)	1 questionable result
	lb	0.8186 (lab 3)	2.09 (lab 11)	1 questionable result

5.2 PCDD/F-congeners

Table 7 gives an overview of the lowest and highest reported values for all PCDD/F-congeners, whether the uncertainty of the assigned value is $> 0.3\sigma_H$ and the number of questionable of unsatisfactory z-scores.

Table 7

Lowest and highest reported concentrations for PCDD/F-congeners.

Material	Compound	Lowest value (ng / kg)	Highest value (ng / kg)	Questionable or unsatisfactory z-scores	Remarks
1	2,3,7,8-TCDD	0.22 (lab 15)	0.34997 (lab 10)		
	1,2,3,7,8-PeCDD	0.191 (lab 3)	0.3945 (lab 10)		uncertainty > 0.3 σ_H
	1,2,3,4,7,8-HxCDD	0.22 (lab 6)	0.322 (lab 4)		
	1,2,3,6,7,8-HxCDD	0.21 (lab 6)	0.46765 (lab 10)		uncertainty > 0.3 σ_H
	1,2,3,7,8,9-HxCDD	0.03 (lab 10)	0.31 (lab 8)	1 unsatisfactory result	
	1,2,3,4,6,7,8-HpCDD	0.23 (lab 5)	0.726 (lab 4)	1 questionable and 1 unsatisfactory result	uncertainty > 0.3 σ_H
	1,2,3,4,6,7,8,9-OCDD	0.386 (lab 3)	3.72 (lab 4)	1 questionable and 1 unsatisfactory result	uncertainty > 0.3 σ_H
	2,3,7,8-TCDF	0.241 (lab 16)	0.53 (lab 13)	1 questionable result	uncertainty > 0.3 σ_H
	1,2,3,7,8-PeCDF	0.248 (lab 3)	0.405 (lab 4)		
	2,3,4,7,8-PeCDF	0.205 (lab 3)	0.433605 (lab 10)		
	1,2,3,4,7,8-HxCDF	0.26 (lab 6)	0.36 (lab 5)		
	1,2,3,6,7,8-HxCDF	0.24 (lab 1)	0.38 (lab 13)		
	2,3,4,6,7,8-HxCDF	0.28 (lab 13)	0.31 (lab 4)		
	1,2,3,7,8,9-HxCDF	0.02 (lab 10)	0.52 (lab 5)	2 unsatisfactory results	uncertainty > 0.3 σ_H
	1,2,3,4,6,7,8-HpCDF	0.2 (lab 6)	0.626 (lab 4)	1 unsatisfactory result	
	1,2,3,4,7,8,9-HpCDF	0.02 (lab 10)	0.38 (lab 5)	1 unsatisfactory result	
	1,2,3,4,6,7,8,9-OCDF	0.08 (lab 10)	0.901 (lab 4)	1 questionable and 2 unsatisfactory results	uncertainty > 0.3 σ_H
2	2,3,7,8-TCDD	0.04 (lab 2)	0.07 (lab 8)		
	1,2,3,7,8-PeCDD	0.03 (lab 10)	0.13 (lab 5)	2 questionable results	uncertainty > 0.3 σ_H
	1,2,3,4,7,8-HxCDD	0.02 (lab 8)	0.13 (lab 5)	2 questionable and 4 unsatisfactory results	uncertainty > 0.3 σ_H
	1,2,3,6,7,8-HxCDD	0.08 (lab 15)	0.20395 (lab 10)	3 questionable results	uncertainty > 0.3 σ_H
	1,2,3,7,8,9-HxCDD	0.02 (lab 10)	0.13 (lab 5)	1 questionable and 4 unsatisfactory results	uncertainty > 0.3 σ_H
	1,2,3,4,6,7,8-HpCDD	0.03 (lab 10)	0.59 (lab 4)	3 questionable and 3 unsatisfactory results	uncertainty > 0.3 σ_H
	1,2,3,4,6,7,8,9-OCDD	0.04 (lab 10)	3.032 (lab 4)	4 unsatisfactory results	uncertainty > 0.3 σ_H
	2,3,7,8-TCDF	1.2 (lab 16)	1.896 (lab 4)		
	1,2,3,7,8-PeCDF	0.05 (lab 6)	0.329 (lab 16)	1 unsatisfactory result	uncertainty > 0.3 σ_H
	2,3,4,7,8-PeCDF	0.3 (lab 6)	0.6 (lab 5)	1 questionable result	uncertainty > 0.3 σ_H
	1,2,3,4,7,8-HxCDF	0.01 (lab 10)	0.17 (lab 2)	1 questionable and 2 unsatisfactory results	uncertainty > 0.3 σ_H
	1,2,3,6,7,8-HxCDF	0.05 (lab 6)	0.13 (lab 5)	2 questionable results	uncertainty > 0.3 σ_H
	2,3,4,6,7,8-HxCDF	0.01 (lab 10)	0.136 (lab 11)	1 questionable and 1 unsatisfactory result	uncertainty > 0.3 σ_H
	1,2,3,7,8,9-HxCDF	0.013 (lab 4)	0.13 (lab 5)	4 questionable and 1 unsatisfactory result	uncertainty > 0.3 σ_H

Material	Compound	Lowest value (ng / kg)	Highest value (ng / kg)	Questionable or unsatisfactory z-scores	Remarks
3a	1,2,3,4,6,7,8-HpCDF	0.01 (lab 10)	0.31 (lab 4)	2 unsatisfactory results	uncertainty > 0.3 σ_H
	1,2,3,4,7,8,9-HpCDF	0.02 (labs 7, 8, 10)	0.2 (lab 13)	3 questionable and 2 unsatisfactory results	uncertainty > 0.3 σ_H
	1,2,3,4,6,7,8,9-OCDF	0.05 (lab 8)	2 (lab 3)	3 questionable and 4 unsatisfactory results	uncertainty > 0.3 σ_H
	2,3,7,8-TCDD	0.28 (lab 6)	0.39 (lab 8)		
	1,2,3,7,8-PeCDD	0.28 (lab 6)	0.452 (lab 4)		
	1,2,3,4,7,8-HxCDD	0.03 (lab 10)	0.386 (lab 4)	1 unsatisfactory result	
	1,2,3,6,7,8-HxCDD	0.24 (lab 6)	0.51764 (lab 10)		
	1,2,3,7,8,9-HxCDD	0.03 (lab 10)	0.366 (lab 4)	1 unsatisfactory result	
	1,2,3,4,6,7,8-HpCDD	0.03 (lab 10)	1.007 (lab 4)	2 unsatisfactory results	uncertainty > 0.3 σ_H
	1,2,3,4,6,7,8,9-OCDD	0.05 (lab 10)	4.204 (lab 4)	3 unsatisfactory results	uncertainty > 0.3 σ_H
	2,3,7,8-TCDF	0.32 (lab 6)	0.671075 (lab 10)		uncertainty > 0.3 σ_H
	1,2,3,7,8-PeCDF	0.37 (lab 1)	0.561 (lab 4)		
	2,3,4,7,8-PeCDF	0.39 (lab 6)	0.591 (lab 4)		
	1,2,3,4,7,8-HxCDF	0.3 (lab 6)	0.45 (lab 2)		
	1,2,3,6,7,8-HxCDF	0.32 (lab 2)	0.42 (lab 8)		
	2,3,4,6,7,8-HxCDF	0.22 (lab 6)	0.38 (lab 8)		uncertainty > 0.3 σ_H
	1,2,3,7,8,9-HxCDF	0.25 (lab 6)	0.42 (lab 15)		
	1,2,3,4,6,7,8-HpCDF	0.218105 (lab 10)	0.778 (lab 4)	1 unsatisfactory result	
	1,2,3,4,7,8,9-HpCDF	0.02 (lab 10)	0.454 (lab 4)	1 unsatisfactory result	uncertainty > 0.3 σ_H
	1,2,3,4,6,7,8,9-OCDF	0.1 (lab 10)	1.04 (lab 4)	1 questionable and 1 unsatisfactory result	uncertainty > 0.3 σ_H
3b	2,3,7,8-TCDD	0.31 (lab 13)	0.39 (lab 5)		
	1,2,3,7,8-PeCDD	0.269 (lab 3)	0.4 (lab 7)		
	1,2,3,4,7,8-HxCDD	0.24 (lab 5)	0.377 (lab 16)		
	1,2,3,6,7,8-HxCDD	0.33 (lab 5)	0.495 (lab 11)		
	1,2,3,7,8,9-HxCDD	0.3 (lab 5)	0.373 (lab 16)		
	1,2,3,4,6,7,8-HpCDD	0.29 (lab 5)	0.577 (lab 16)		uncertainty > 0.3 σ_H
	1,2,3,4,6,7,8,9-OCDD	0.46 (lab 5)	1.45 (lab 16)	1 questionable and 1 unsatisfactory result	uncertainty > 0.3 σ_H
	2,3,7,8-TCDF	0.385 (lab 12)	0.66 (lab 13)		
	1,2,3,7,8-PeCDF	0.303 (lab 3)	0.46 (lab 13)		
	2,3,4,7,8-PeCDF	0.328 (lab 3)	0.64 (lab 5)		uncertainty > 0.3 σ_H
	1,2,3,4,7,8-HxCDF	0.34 (lab 3)	0.46 (lab 5)		
	1,2,3,6,7,8-HxCDF	0.35 (lab 5)	0.365 (lab 16)		
	2,3,4,6,7,8-HxCDF	0.303 (lab 3)	0.389 (lab 11)		
	1,2,3,7,8,9-HxCDF	0.31 (lab 7)	0.57 (lab 5)	1 questionable result	
	1,2,3,4,6,7,8-HpCDF	0.317 (lab 3)	0.41 (lab 13)		
	1,2,3,4,7,8,9-HpCDF	0.321 (lab 11)	0.51 (lab 5)		
	1,2,3,4,6,7,8,9-OCDF	0.303 (lab 3)	0.623 (lab 16)	1 questionable result	uncertainty > 0.3 σ_H

The uncertainty of the assigned value exceeded $0.3\sigma_H$ in material 1 for six compounds, in material 2 for 14 compounds, for materials 3a for six compounds and for material 3b for four compounds and therefore the uncertainty is taken into account in the evaluation of the laboratories (equation II, §4.4). With respect to the accuracy 35 results were questionable (and 48 results were unsatisfactory).

5.3 Dioxin-like PCBs

Table 8 shows the lowest and highest reported values for PCB 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169 and 189 and whether the uncertainty of the assigned value is $> 0.3\sigma_H$ and the number of questionable of unsatisfactory z-scores.

Table 8

Lowest and highest reported concentrations for dioxin-like PCBs.

Material	PCB	Lowest value (ng / kg)	Highest value (ng / kg)	Questionable or unsatisfactory z-scores	Remarks
1	77	2.786 (lab 3)	10.01 (lab 10)	3 questionable results	
	81	2.175 (lab 3)	7.65 (lab 4)	1 questionable result	
	105	63.16 (lab 4)	87.1 (lab 16)		
	114	66 (lab 7)	94.56 (lab 13)		
	118	64 (lab 7)	110.34 (lab 8)		
	123	65.1 (lab 6)	91.5 (lab 15)		
	126	2.402 (lab 3)	8.14 (lab 4)	1 questionable result	
	156	59.09 (lab 4)	90.4 (lab 16)		
	157	52.6 (lab 4)	82.33 (lab 10)		
	167	62.59 (lab 4)	84.3 (lab 16)		
	169	2.112 (lab 3)	5.9 (lab 8)	1 questionable result	
	189	59.6 (lab 3)	87.2 (lab 16)		
2	77	9.853 (lab 3)	29.3 (lab 11)	1 questionable result	
	81	0.4 (lab 4)	13.1 (lab 11)	1 questionable and 2 unsatisfactory results	
	105	324.3 (lab 8)	424 (lab 16)		
	114	20.91 (lab 10)	39.2 (lab 11)		
	118	897.15 (lab 8)	1361.9 (lab 5)		
	123	9.1 (lab 5)	92 (lab 1)	1 questionable and 1 unsatisfactory result	uncertainty $> 0.3\sigma_H$
	126	2.959 (lab 3)	10.2 (lab 6)	1 questionable result	
	156	87.38 (lab 13)	115 (lab 16)		
	157	24.63 (lab 4)	32.73 (lab 8)		
	167	59.71 (lab 4)	81.1 (lab 16)		
	169	1 (lab 3)	5 (lab 11)	1 unsatisfactory result	uncertainty $> 0.3\sigma_H$
	189	7.44 (lab 4)	10.75 (lab 8)		

Material	PCB	Lowest value (ng / kg)	Highest value (ng / kg)	Questionable or unsatisfactory z-scores	Remarks
3a	77	3.4 (lab 12)	7.68 (lab 8)	1 unsatisfactory result	uncertainty > $0.3\sigma_H$
	81	0.52 (lab 4)	2 (lab 6)	1 unsatisfactory result	uncertainty > $0.3\sigma_H$
	105	93.6 (lab 6)	126.95 (lab 10)		
	114	79.2 (lab 6)	102.3 (lab 10)		
	118	177.1 (lab 8)	279.58 (lab 10)		
	123	71.3 (lab 6)	96.5 (lab 12)		
	126	12.9 (lab 1)	23.47 (lab 4)		
	156	160.38 (lab 4)	226.855 (lab 10)		
	157	85.83 (lab 4)	110.13 (lab 8)		
	167	123.2 (lab 6)	184.825 (lab 10)		
	169	3.3 (lab 6)	4.51 (lab 8)		
	189	96 (lab 6)	124.59 (lab 8)		
3b	77	1.791 (lab 3)	10.9 (lab 13)	1 unsatisfactory result	
	81	0.901 (lab 12)	5 (lab 11)	1 unsatisfactory result	
	105	93.75 (lab 13)	119 (lab 16)		
	114	84 (lab 7)	109 (lab 11)		
	118	202 (lab 7)	241 (lab 16)		
	123	85 (lab 7)	98.3 (lab 5)		
	126	7.381 (lab 3)	18.4 (lab 13)	1 questionable result	
	156	175.56 (lab 13)	215 (lab 3)		
	157	97.7 (lab 5)	129 (lab 7)		
	167	151 (lab 7)	177 (lab 16)		
	169	1.612 (lab 3)	5 (lab 11)	1 questionable result	
	189	102 (lab 7)	123 (lab 11)		

The uncertainty of the assigned value exceeded $0.3\sigma_H$ in materials 2 and 3a for two compounds and therefore the uncertainty is taken into account in the evaluation of the laboratories (equation II, §4.4). With respect to the accuracy 12 results were questionable (labs 4, 7, 8 and 13 once and lab 3 eight times) and 8 results were unsatisfactory (labs 1, 8 and 13 once, lab 6 twice and lab 11 three times).

5.4 Non dioxin-like PCBs

Table 9 shows the lowest and highest reported values for PCB 28, 52, 101, 138, 153 and 180 and whether the uncertainty of the assigned value is $> 0.3\sigma_H$ and the number of questionable or unsatisfactory z-scores.

Table 9

Lowest and highest reported concentrations for non dioxin-like PCBs.

Material	PCB	Lowest value (ng / kg)	Highest value (ng / kg)	Remarks
1	28	2530 (lab 3)	3250 (lab 16)	
	52	1926 (13)	2800 (lab 1)	
	101	1630 (lab 2)	2660 (lab 8)	1 questionable result
	138	2720 (lab 6)	3400 (lab 5)	
	153	2110 (lab 2)	3300 (lab 1)	1 questionable result
	180	2408 (lab 13)	3420 (lab 12)	
2	28	340.25 (lab 10)	2000 (lab 1)	2 unsatisfactory results
	52	670 (lab 13)	2000 (lab 1)	1 questionable and 1 unsatisfactory result
	101	1101 (lab 13)	2000 (lab 1)	1 questionable result
	138	1434 (lab 13)	2120 (lab 8)	
	153	2000 (lab 1)	2806 (lab 6)	
	180	500 (lab 13)	2000 (lab 1)	2 unsatisfactory results
3a	28	8.9 (lab 12)	2000 (lab 1)	1 unsatisfactory result
	52*	3.48 (lab 2)	2000 (lab 1)	1 questionable and 1 unsatisfactory result
	101	6.58 (lab 2)	2000 (lab 1)	1 questionable and 1 unsatisfactory result
	138	807.005 (lab 10)	2000 (lab 1)	1 unsatisfactory result
	153	1040 (lab 2)	2000 (lab 1)	
	180	539.22 (lab 4)	2000 (lab 1)	1 questionable and 1 unsatisfactory result
3b	28	5136 (lab 13)	6430 (lab 16)	
	52	3701 (lab 13)	5080 (lab 16)	
	101	3724 (lab 13)	5290 (lab 11)	
	138	6370 (lab 13)	7700 (lab 5)	
	153	5720 (lab 7)	6523 (lab 12)	
	180	5093 (lab 13)	7524 (lab 12)	1 questionable result

* Uncertainty of assigned value is very high, results are presented for information only.

The uncertainty of the assigned value exceeded $0.3\sigma_H$ in material 3a for four compounds and, therefore, the uncertainty was taken into account in the evaluation of the laboratories (equation II, §4.4). With respect to the accuracy 8 results were questionable (labs 1 and 2 once, labs 4 and 13 three times) and 12 results were unsatisfactory (lab 5 twice and lab 1 10 times).

6 Conclusions and recommendations

Fifteen laboratories participated and reported results for the proficiency test of dioxins and dioxin-like PCBs in fat. Out of these, no laboratories showed optimal performance by quantifying all congeners and sum-TEQs correctly. However, twelve labs (labs 1, 2, 5, 6, 7, 8, 10, 11, 12, 14, 15, 16) reported correct sum-TEQs for both PCDD/Fs and PCBs. Lab 3 reported $|z\text{-scores}| > 2$ for the ub, mb and lb PCB-TEQ in all three materials, lab 4 for the ub, mb and lb PCDD/Fs-TEQ in material 2 and lab 9 for the ub PCDD/F-TEQ in material 2 and for the ub PCB-TEQ in materials 1 and 3.

Wide ranges of results were reported in this PT: for more than 25% of the compound-material combinations the uncertainty of the assigned value exceeded $0.3\sigma_H$, indicating large variability in results. Of 1739 possible z-scores, 138 results were questionable/unsatisfactory (7.9%).

Whether the samples were compliant or non-compliant resulted in a fair amount of questions and a variety in results. However, labs 2, 6, 8, 11, 12, 13 and 16 assigned all materials correctly as compliant or non-compliant.

Based on the results of this study it is concluded that:

- The quantification of PCBs leads to better results than the quantification of the PCDD/Fs, which may be related to the higher concentrations of PCBs present in the samples;
- The LODs reported by some participants are high and need additional attention.
- The assignment of the samples as compliant or non-compliant needs additional attention. Only seven out of 15 labs assigned all materials correctly as compliant or non-compliant.
- Not every lab applied EC/152/2009 for correction for moisture content and for re-analysis in case of a non-compliant screening result.
- More effort is needed for correct quantification of the individual congeners.

References

- 1 Council directive 93/99/EEC of 29 October 1993 on the subject of additional measures concerning the official control of foodstuffs. Off J Eur Commun L 290, 24/11/1993, 0014 - 0017.
- 2 ISO/IEC 17025:2005(E). 2005. General Requirements for the Competence of Calibration and Testing Laboratories.
- 3 ISO/IEC 17043:2010. 2010. Conformity assessment - General requirements for Proficiency Testing.
- 4 Journal of AOAC international (2006) vol. 89, no. 4, 1095-1109.
- 5 SOPA0989 - De bereiding van referentiematerialen en referentiemonsters - RIKILT.
- 6 Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002.
- 7 Thompson M, Ellison SL, Wood R. 2006. The International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories. Pure Appl. Chem. 78(1):145-196.
- 8 ISO 13528:2005(E). 2005. Statistical methods for use in proficiency testing by inter-laboratory comparison, 1st edition.
- 9 Thompson M. 2000. Recent trends in inter-laboratory precision at ppb and sub-ppb concentrations in relation to fitness for purpose criteria in proficiency testing. Analyst. 125:385-386.
- 10 McClure FD. 1990. Design and analysis of qualitative collaborative studies: minimum collaborative program. JAOAC Int. 73 (6): 953-960.
- 11 Analytical Methods Committee. 1989. Robust statistics - How not to reject outliers Part 1. Basic concepts. Analyst 114:1693-1697.
- 12 Analytical Methods Committee. 1989. Robust statistics - How not to reject outliers Part 2. Inter-laboratory trials. Analyst. 114:1699-1702.
- 13 Commission Regulation no 277/2012 of 28 March 2012.
- 14 Commission Regulation no 152/2009 of 27 January 2009.
- 15 Commission Regulation no 225/2012 of 15 March 2012.

Annex 1 Codification of the samples

Lab number	Material 1 *	Material 2 *	Material 3a *	Material 3b *
1	97	55	114	
2	95	115	79	
3	104	10		46
4	66	91	36	
5	13	16		67
6	23	12	101	
7	106	111		109
8	94	78	51	
9	8	39		86
10	113	24	19	
11	81	103		100
12	1	54	14	92
13	73	87		2
15	80	48	17	
16	21	5		110

* All sample codes start with DIOX/2013/fat/.

Annex 2 Statistical evaluation of homogeneity data for PCB 138

PCB 138 in material 1 ($\mu\text{g/kg}$).

Sample number	Replicate 1	Replicate 2
Hom/1-001	3.20	3.16
Hom/1-002	3.05	3.19
Hom/1-003	3.14	3.16
Hom/1-004	3.11	3.08
Hom/1-005	3.19	3.16
Hom/1-006	3.27	3.32
Hom/1-007	3.21	3.19
Hom/1-008	3.17	3.10
Hom/1-009	3.11	3.02
Hom/1-010	3.22	3.11
Grand mean	3.16	
Cochran's test		
C	0.381	
Ccrit	0.602	
C < Ccrit?	NO OUTLIERS	
Target $s = \sigma_H$	Horwitz: 0.69	
S_x	0.06	
S_w	0.05	
S_s	0.05	
Critical = $0.3\sigma_H$	0.21	
$S_s < \text{critical?}$	ACCEPTED	
$S_w < 0.5\sigma_H?$	ACCEPTED	

S_x = Standard deviation of the sample averages.

S_w = Within-sample standard deviation.

S_s = Between-sample standard deviation.

PCB 138 in material 2 ($\mu\text{g/kg}$).

Sample number	Replicate 1	Replicate 2
Hom/2-001	1.69	1.69
Hom/2-002	1.70	1.70
Hom/2-003	1.74	1.74
Hom/2-004	1.72	1.71
Hom/2-005	1.69	1.75
Hom/2-006	1.71	1.71
Hom/2-007	1.73	1.74
Hom/2-008	1.69	1.69
Hom/2-009	1.79	1.72
Hom/2-010	1.76	1.74
Grand mean	1.72	
Cochran's test		
C	0.538	
Ccrit	0.602	
C < Ccrit?	NO OUTLIERS	
Target $s = \sigma_H$	Horwitz: 0.38	
S_x	0.02	
S_w	0.02	
S_s	0.02	
Critical = $0.3\sigma_H$	0.11	
$S_s < \text{critical?}$	ACCEPTED	
$S_w < 0.5\sigma_H?$	ACCEPTED	

S_x = Standard deviation of the sample averages.

S_w = Within-sample standard deviation.

S_s = Between-sample standard deviation.

PCB 153 in material 3a (µg/kg).

Sample number	Replicate 1	Replicate 2
Hom/2-001	1.13	1.21
Hom/2-002	1.24	1.25
Hom/2-003	1.17	1.19
Hom/2-004	1.18	1.21
Hom/2-005	1.21	1.25
Hom/2-006	1.21	1.23
Hom/2-007	1.22	1.21
Hom/2-008	1.20	1.26
Hom/2-009	1.25	1.26
Hom/2-010	1.24	1.26
Grand mean	1.22	
Cochran's test		
C	0.457	
Ccrit	0.602	
C<Ccrit?	NO OUTLIERS	
Target s = σ_H	Horwitz: 0.27	
S _x	0.03	
S _w	0.03	
S _s	0.02	
Critical = $0.3\sigma_H$	0.08	
S _s <critical?	ACCEPTED	
S _w < $0.5\sigma_H$?	ACCEPTED	

S_x = Standard deviation of the sample averages.

S_w = Within-sample standard deviation.

S_s = Between-sample standard deviation.

PCB 153 in material 3b (µg/kg).

Sample number	Replicate 1	Replicate 2
Hom/2-001	6.12	6.07
Hom/2-002	6.13	6.34
Hom/2-003	6.18	5.89
Hom/2-004	6.16	6.22
Hom/2-005	6.28	6.32
Hom/2-006	6.29	6.12
Hom/2-007	6.91	6.21
Hom/2-008	5.65	6.27
Hom/2-009	6.20	6.12
Hom/2-010	6.20	6.22
Grand mean	6.19	
Cochran's test		
C	0.468	
Ccrit	0.602	
C<Ccrit?	NO OUTLIERS	
Target s = σ_H	Horwitz: 1.36	
S _x	0.16	
S _w	0.23	
S _s	0.02	
Critical = $0.3\sigma_H$	0.41	
S _s <critical?	ACCEPTED	
S _w < $0.5\sigma_H$?	ACCEPTED	

S_x = Standard deviation of the sample averages.

S_w = Within-sample standard deviation.

S_s = Between-sample standard deviation.

Annex 3 Instruction letter



For quality of life

P.O. Box 230 | 6700 AE WAGENINGEN | The Netherlands

Dear colleague,

Enclosed you will find the samples with respect to the proficiency test:

"Dioxins and dioxin-like PCBs in fats"
in which you kindly agreed to participate.

The objectives of this study is to analyse dioxins, dioxin-like PCB's according to the enactment of EU Regulation 225/2012.

Your laboratory code is: 14

Samples

- Three oil samples are supplied for the analysis of dioxins and dioxin-like PCBs. Each bottle contains approximately 10 ml oil.
- After arrival store the samples according to your laboratory procedure.
- Carry out a single analysis for each sample.

Results/Report

- Please return the results before May 10th 2013.
- Please use the results form for reporting the results.
- A report of the proficiency study will be dispatched in May/June 2013.
- Results of the inter-laboratory study will be presented anonymously.
- RIKILT is allowed to use the anonymous results of the proficiency test in presentations, seminars and publications.

Please contact me in case you have any remaining questions. Good luck with the study and kind regards,

Yours sincerely,

Sabrina Oostra/Ingrid Elhers
RIKILT
Wageningen

Veterinary Drugs

DATE
April 23, 2013

SUBJECT
proficiency test

OUR REFERENCE
13/RIK0272

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Wageningen UR (Wageningen University and various research institutes) is specialised in the domain of healthy food and living environment.

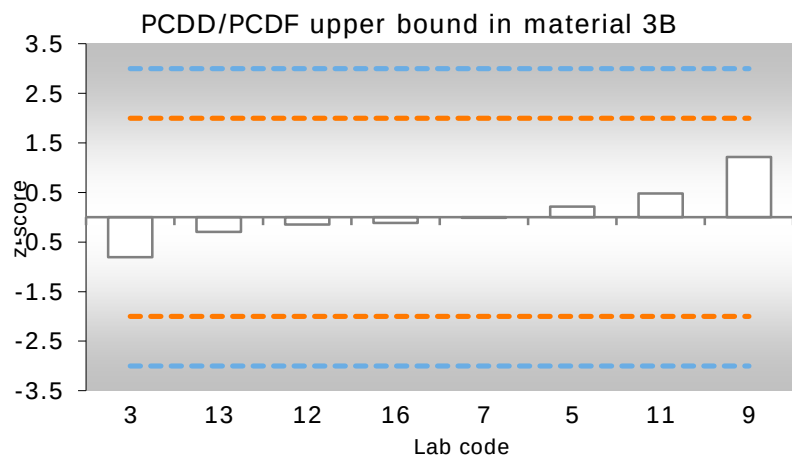
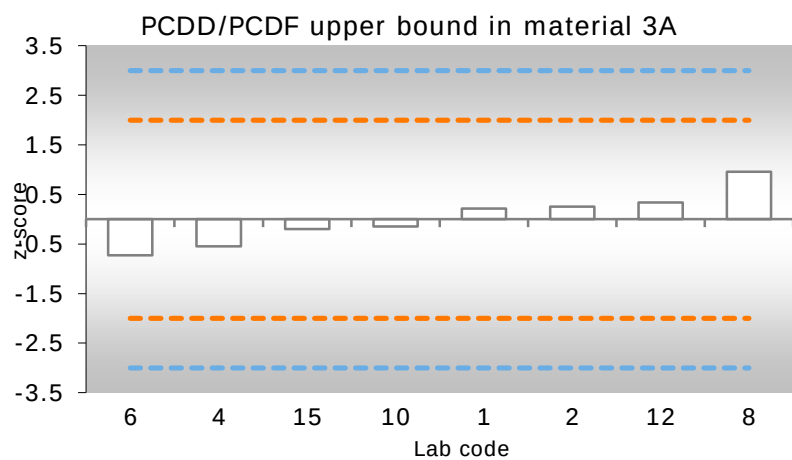
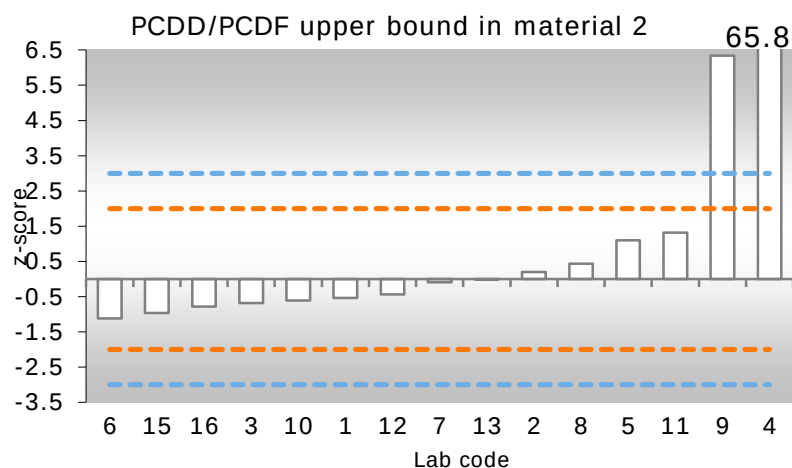
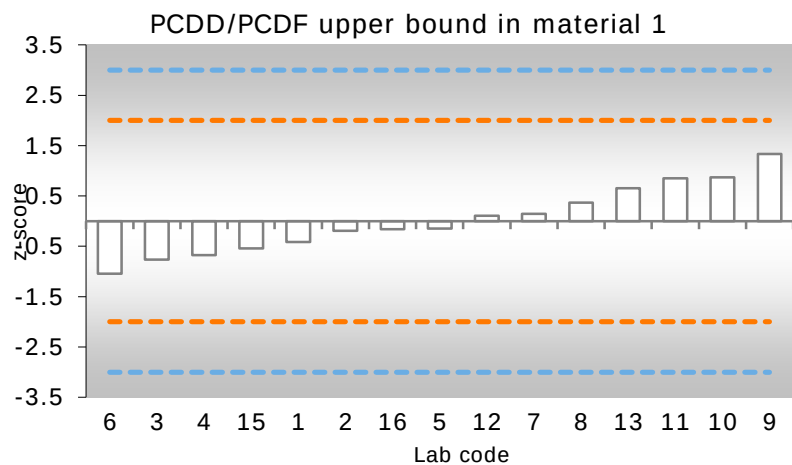
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Annex 4 Overview of the applied methods

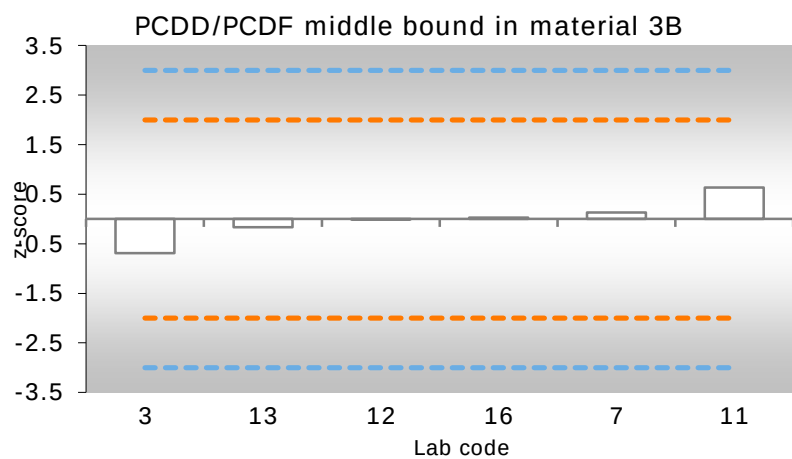
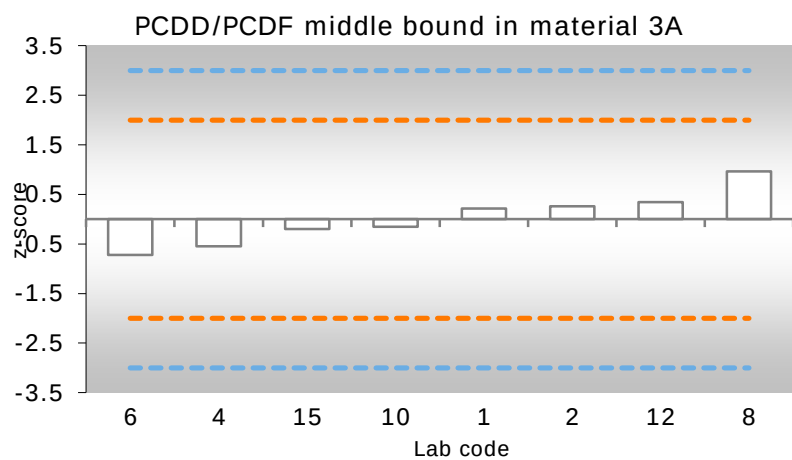
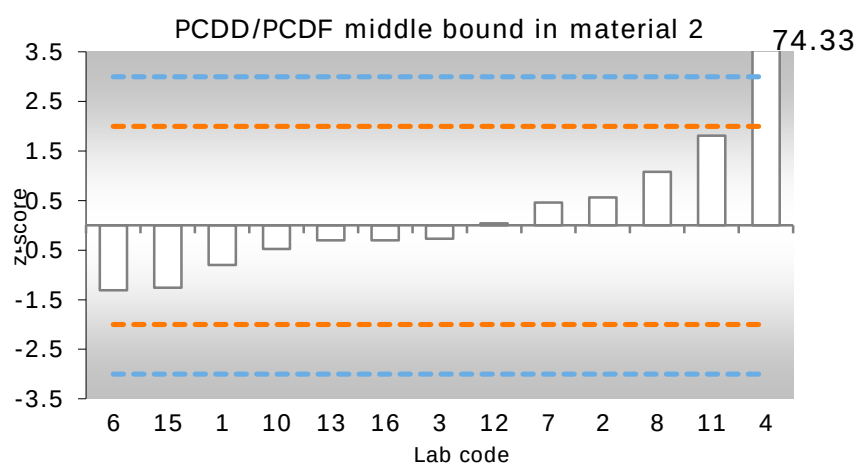
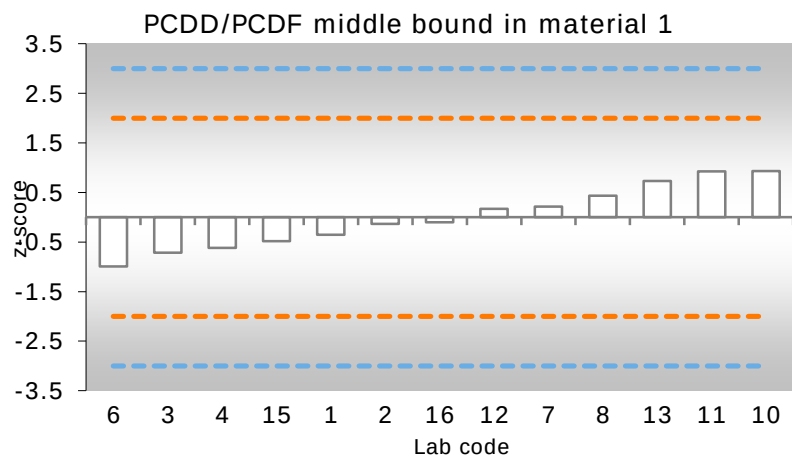
Lab	Grams of fat on column for PCDD / Fs	Grams of fat on column for PCBs	Detection technique PCDD / Fs	Detection technique PCBs
1	2.4	2.4	GC-MS/MS	GC-MS
2	1.5	0.12	GC-HRMS	GC-HRMS
3	0.5	0.5	GC-HRMS	GC-HRMS
4		no information		
5	no information		GC-MS/MS	GC-MS/MS
6	0.4	0.4	GC-MS/MS	GC-HRMS
7	0.9	0.9	GC-MS/MS	GC-HRMS
8	1.2	1.2	GC-HRMS	GC-HRMS
		0.6 (for ortho-PCBs)		GC-LRMS (for ortho-PCBs)
9			CALUX assay	CALUX assay
10	0.5	0.03 (for non-ortho-PCBs) 0.004 (for di, mono-ortho PCBs)	GC-HRMS	GC-HRMS
11	2.5	0.025	GC-HRMS	GC-HRMS
12	0.5	0.01	GC-HRMS	GC-HRMS
13	0.6	0.6	GC-HRMS	GC-HRMS
15	1	1	GC-HRMS	GC-HRMS
16	0.3	0.3	GC-HRMS	GC-HRMS

Annex 5 Results

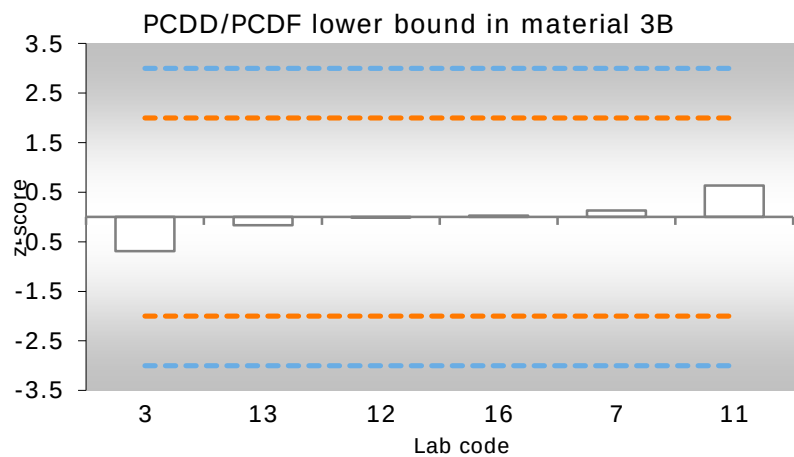
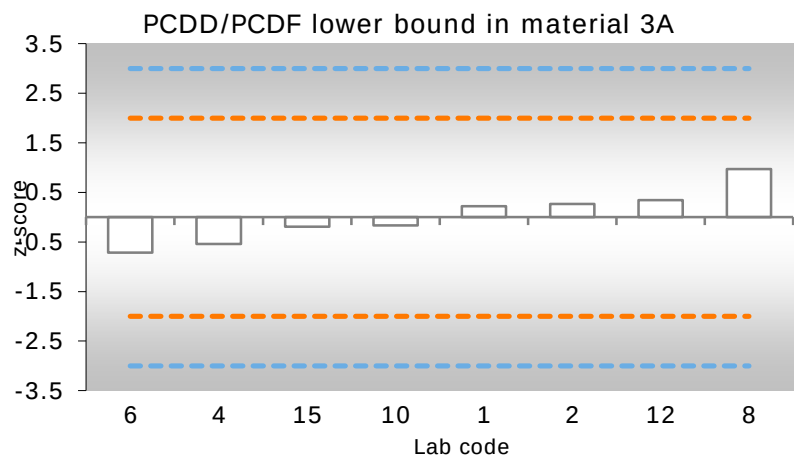
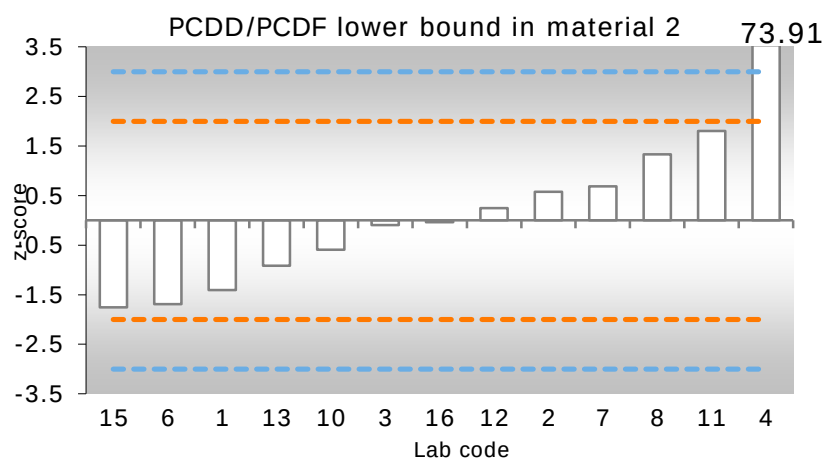
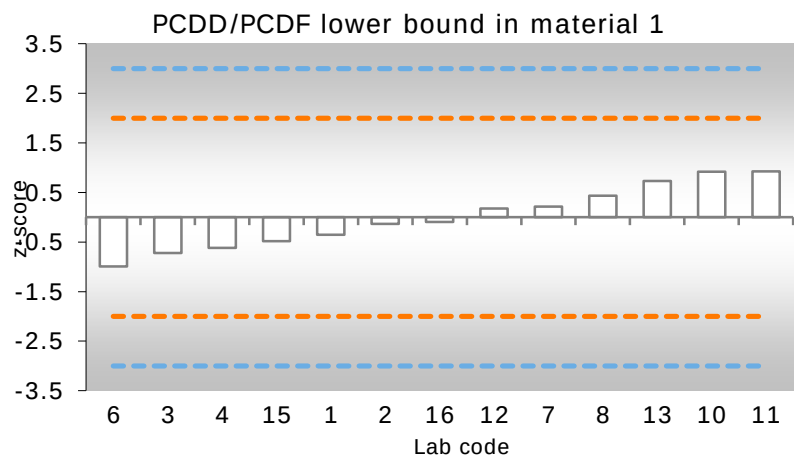
Lab code	PCDD/F-TEQ ub (material 1)		PCDD/F-TEQ ub (material 2)		PCDD/F-TEQ ub (material 3a)		PCDD/F-TEQ ub (material 3b)	
	AV: 0.9350 ng/kg		AV: 0.4908 ng/kg		AV: 1.0985 ng/kg		AV: 1.2301 ng/kg	
	Uncertainty of AV: 0.0485 ng/kg		Uncertainty of AV: 0.0350 ng/kg		Uncertainty of AV: 0.0513 ng/kg		Uncertainty of AV: 0.0519 ng/kg	
	Target sd: 0.2057 ng/kg		Target sd: 0.1080 ng/kg		Target sd: 0.2417 ng/kg		Target sd: 0.2706 ng/kg	
	Robust sd: 0.1503 ng/kg		Robust sd: 0.1083 ng/kg		Robust sd: 0.1161 ng/kg		Robust sd: 0.1174 ng/kg	
	Result (ng/kg)	z _a -score	Result (ng/kg)	z' _a -score	Result (ng/kg)	z _a -score	Result (ng/kg)	z _a -score
1	0.85	-0.41	0.43	-0.54	1.15	0.21		
2	0.895	-0.19	0.513	0.20	1.16	0.25		
3	0.7772	-0.77	0.4132	-0.68			1.0126	-0.80
4	0.796	-0.68	7.958	65.80	0.966	-0.55		
5	0.905	-0.15	0.615	1.09			1.289	0.22
6	0.72	-1.05	0.364	-1.12	0.923	-0.73		
7	0.965	0.15	0.48	-0.09			1.227	-0.01
8	1.01	0.36	0.54	0.43	1.33	0.96		
9	1.21	1.34	1.21	6.34			1.56	1.22
10	1.113332255	0.87	0.4216789	-0.61	1.06340875	-0.15		
11	1.11	0.85	0.64	1.32			1.36	0.48
12	0.957	0.11	0.441	-0.44	1.18	0.34	1.19	-0.15
13	1.07	0.66	0.49	-0.01			1.15	-0.30
15	0.824	-0.54	0.381	-0.97	1.05	-0.20		
16	0.902	-0.16	0.402	-0.78			1.2	-0.11



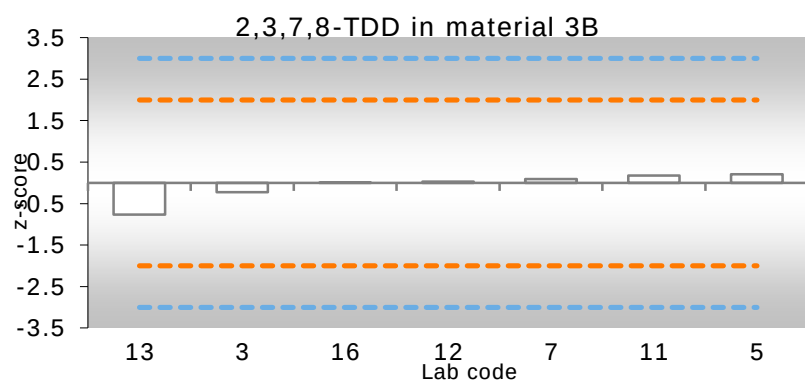
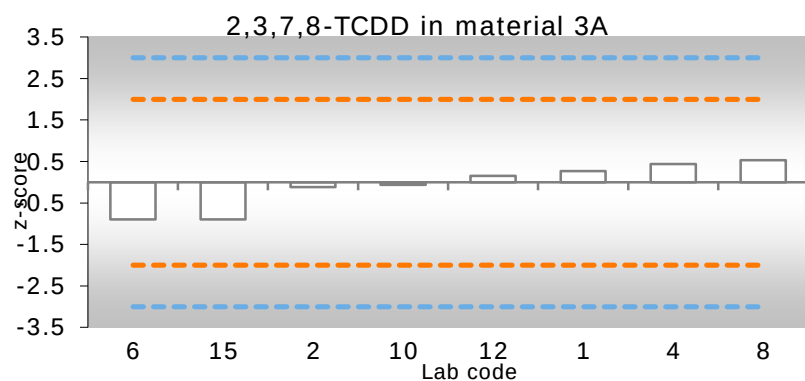
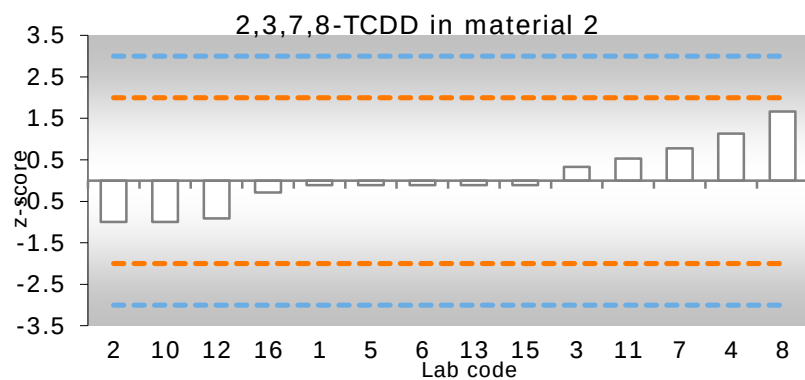
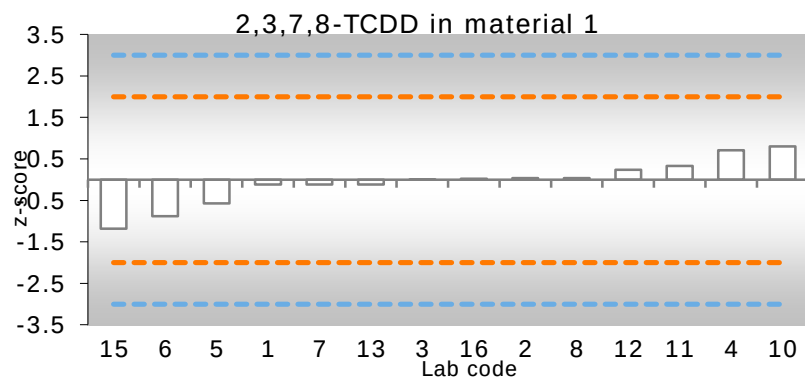
Lab code	PCDD/F-TEQ mb (material 1)		PCDD/F-TEQ mb (material 2)		PCDD/F-TEQ mb (material 3a)		PCDD/F-TEQ mb (material 3b)	
	AV: 0.9220 ng/kg		AV: 0.4306 ng/kg		AV: 1.0975 ng/kg		AV: 1.1928 ng/kg	
	Uncertainty of AV: 0.0512 ng/kg		Uncertainty of AV: 0.0358 ng/kg		Uncertainty of AV: 0.0515 ng/kg		Uncertainty of AV: 0.0332 ng/kg	
	Target sd: 0.2028 ng/kg		Target sd: 0.0947 ng/kg		Target sd: 0.2415 ng/kg		Target sd: 0.2624 ng/kg	
	Robust sd: 0.1478 ng/kg		Robust sd: 0.1033 ng/kg		Robust sd: 0.1166 ng/kg		Robust sd: 0.0651 ng/kg	
	Result (ng/kg)	z _a -score	Result (ng/kg)	z' _a -score	Result (ng/kg)	z _a -score	Result (ng/kg)	z _a -score
1	0.85	-0.36	0.35	-0.80	1.15	0.22		
2	0.895	-0.13	0.488	0.57	1.16	0.26		
3	0.7766	-0.72	0.4036	-0.27			1.012	-0.69
4	0.796	-0.62	7.958	74.33	0.966	-0.54		
5								
6	0.72	-1.00	0.298	-1.31	0.923	-0.72		
7	0.965	0.21	0.477	0.46			1.227	0.13
8	1.01	0.43	0.54	1.08	1.33	0.96		
9								
10	1.110720255	0.93	0.3823624	-0.48	1.06013625	-0.15		
11	1.11	0.93	0.614	1.81			1.36	0.64
12	0.957	0.17	0.435	0.04	1.18	0.34	1.19	-0.01
13	1.07	0.73	0.4	-0.30			1.15	-0.16
15	0.824	-0.48	0.303	-1.26	1.05	-0.20		
16	0.902	-0.10	0.401	-0.30			1.2	0.03



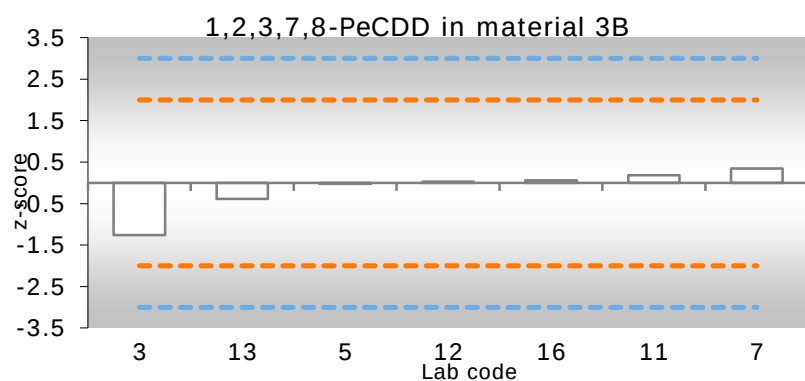
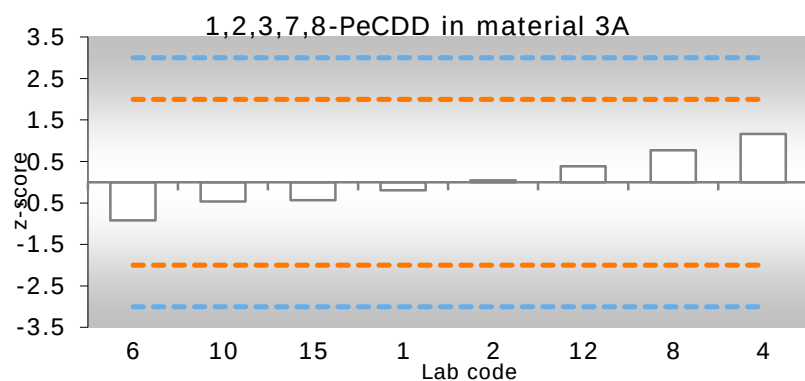
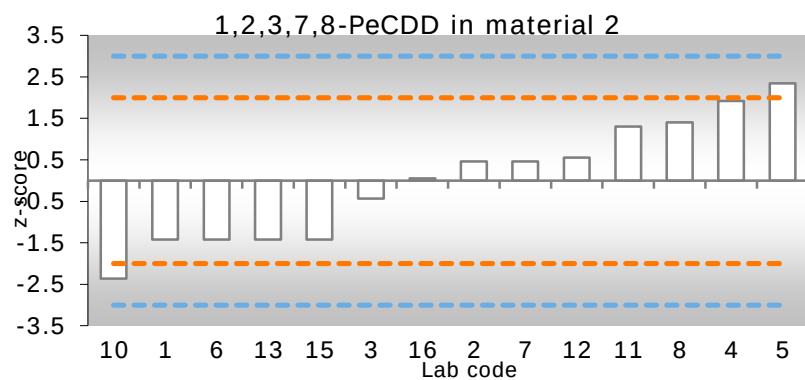
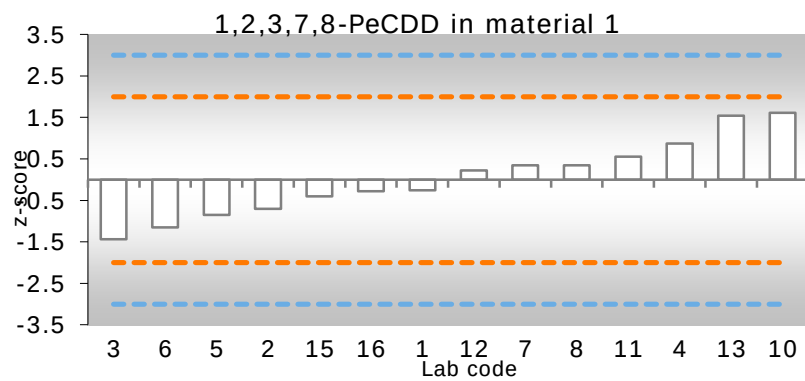
	PCDD/F-TEQ lb (material 1)		PCDD/F-TEQ lb (material 2)		PCDD/F-TEQ lb (material 3a)		PCDD/F-TEQ lb (material 3b)	
	AV: 0.9218 ng/kg Uncertainty of AV: 0.0511 ng/kg Target sd: 0.2028 ng/kg Robust sd: 0.1475 ng/kg		AV: 0.4037 ng/kg Uncertainty of AV: 0.0506 ng/kg Target sd: 0.0888 ng/kg Robust sd: 0.1459 ng/kg		AV: 1.0962 ng/kg Uncertainty of AV: 0.0526 ng/kg Target sd: 0.2412 ng/kg Robust sd: 0.1190 ng/kg		AV: 1.1928 ng/kg Uncertainty of AV: 0.0332 ng/kg Target sd: 0.2624 ng/kg Robust sd: 0.0651 ng/kg	
Lab code	Result (ng/kg)	z _a -score	Result (ng/kg)	z' _a -score	Result (ng/kg)	z _a -score	Result (ng/kg)	z _a -score
1	0.85	-0.35	0.26	-1.41	1.15	0.22		
2	0.895	-0.13	0.463	0.58	1.16	0.26		
3	0.776	-0.72	0.394	-0.10			1.0114	-0.69
4	0.796	-0.62	7.958	73.91	0.966	-0.54		
5								
6	0.72	-1.00	0.231	-1.69	0.923	-0.72		
7	0.965	0.21	0.474	0.69			1.227	0.13
8	1.01	0.44	0.54	1.33	1.33	0.97		
9								
10	1.108108255	0.92	0.3430459	-0.59	1.05686375	-0.16		
11	1.11	0.93	0.588	1.80			1.36	0.64
12	0.957	0.17	0.429	0.25	1.18	0.35	1.19	-0.01
13	1.07	0.73	0.31	-0.92			1.15	-0.16
15	0.824	-0.48	0.224	-1.76	1.05	-0.19		
16	0.902	-0.10	0.4	-0.04			1.2	0.03



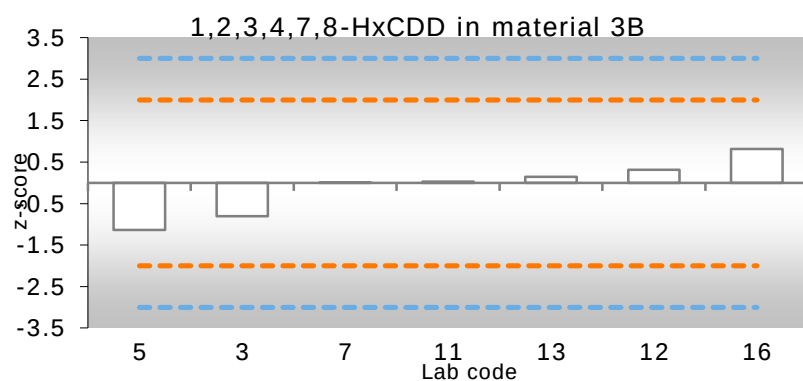
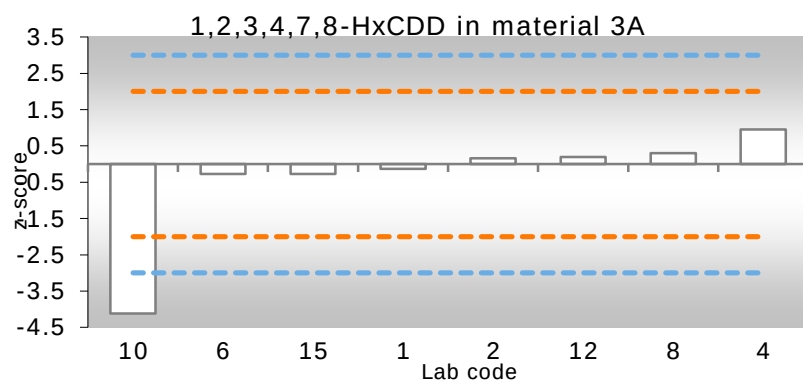
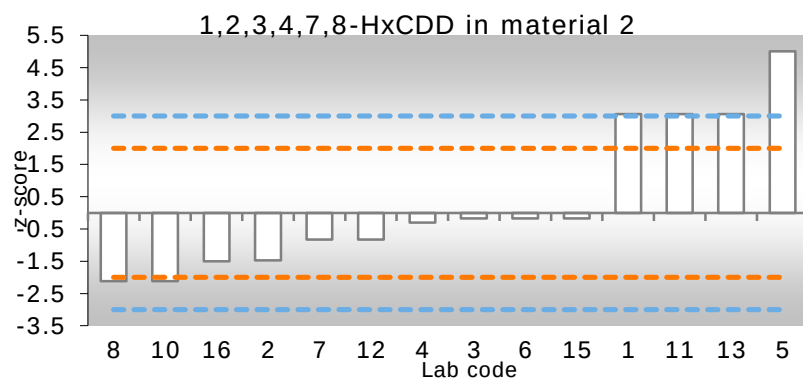
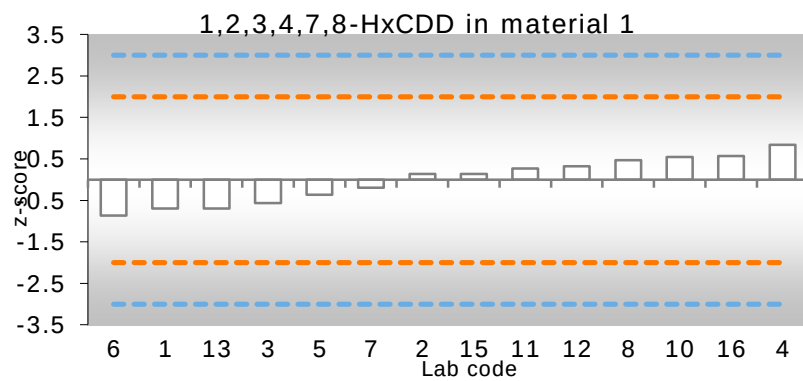
	2,3,7,8-TCDD (material 1)		2,3,7,8-TCDD (material 2)		2,3,7,8-TCDD (material 3a)		2,3,7,8-TCDD (material 3b)	
	AV: 0.2976 ng / kg Uncertainty of AV: 0.0066 ng / kg Target sd: 0.0655 ng / kg Robust sd: 0.0199 ng / kg		AV: 0.0512 ng / kg Uncertainty of AV: 0.0030 ng / kg Target sd: 0.0113 ng / kg Robust sd: 0.0089 ng / kg		AV: 0.3492 ng / kg Uncertainty of AV: 0.0172 ng / kg Target sd: 0.0768 ng / kg Robust sd: 0.0390 ng / kg		AV: 0.3728 ng / kg Uncertainty of AV: 0.0085 ng / kg Target sd: 0.0820 ng / kg Robust sd: 0.0180 ng / kg	
Lab code	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	0.29	-0.12	0.05	-0.11	0.37	0.27		
2	0.3	0.04	0.04	-1.00	0.34	-0.12		
3	0.298	0.01	0.055	0.33			0.354	-0.23
4	0.344	0.71	0.064	1.13	0.383	0.44		
5	0.26	-0.57	0.05	-0.11			0.39	0.21
6	0.24	-0.88	0.05	-0.11	0.28	-0.90		
7	0.29	-0.12	0.06	0.78			0.38	0.09
8	0.3	0.04	0.07	1.66	0.39	0.53		
9								
10	0.34997	0.80	0.04	-1.00	0.344025	-0.07		
11	0.319	0.33	0.0572	0.53			0.387	0.17
12	0.313	0.23	0.041	-0.91	0.361	0.15	0.375	0.03
13	0.29	-0.12	0.05	-0.11			0.31	-0.77
15	0.22	-1.19	0.05	-0.11	0.28	-0.90		
16	0.299	0.02	0.048	-0.29			0.373	0.00



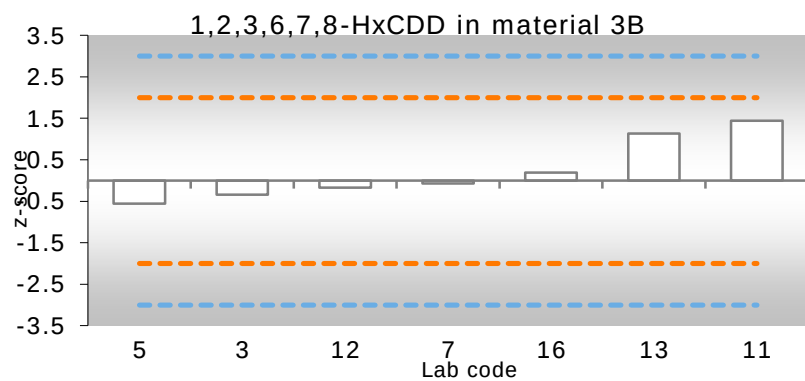
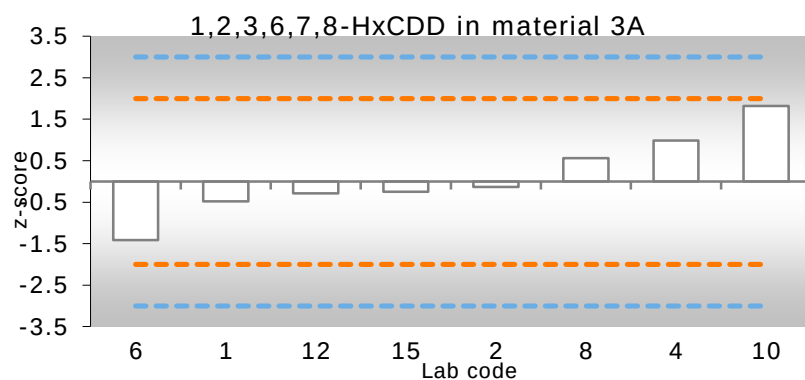
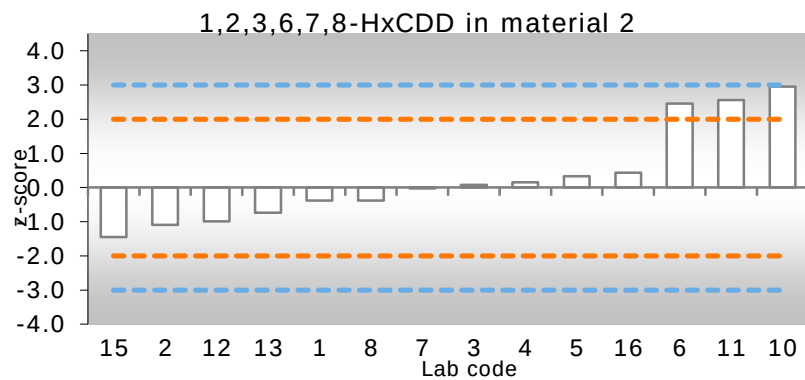
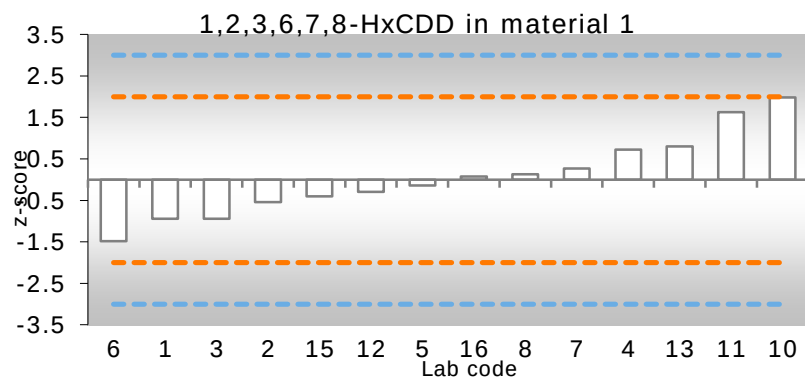
	1,2,3,7,8-PeCDD (material 1)		1,2,3,7,8-PeCDD (material 2)		1,2,3,7,8-PeCDD (material 3a)		1,2,3,7,8-PeCDD (material 3b)	
	AV: 0.2869 ng / kg		AV: 0.0802 ng / kg		AV: 0.3561 ng / kg		AV: 0.3718 ng / kg	
	Uncertainty of AV: 0.0221 ng / kg		Uncertainty of AV: 0.0119 ng / kg		Uncertainty of AV: 0.0264 ng / kg		Uncertainty of AV: 0.0107 ng / kg	
	Target sd: 0.0631 ng / kg		Target sd: 0.0177 ng / kg		Target sd: 0.0783 ng / kg		Target sd: 0.0818 ng / kg	
	Robust sd: 0.0661 ng / kg		Robust sd: 0.0355 ng / kg		Robust sd: 0.0597 ng / kg		Robust sd: 0.0228 ng / kg	
Lab code	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	0.27	-0.25	0.05	-1.42	0.34	-0.19		
2	0.24	-0.70	0.09	0.46	0.36	0.05		
3	0.191	-1.43	0.071	-0.43			0.269	-1.26
4	0.345	0.87	0.121	1.92	0.452	1.16		
5	0.23	-0.85	0.13	2.34			0.37	-0.02
6	0.21	-1.15	0.05	-1.42	0.28	-0.92		
7	0.31	0.34	0.09	0.46			0.4	0.35
8	0.31	0.34	0.11	1.40	0.42	0.77		
9								
10	0.3945	1.61	0.03	-2.36	0.317865	-0.46		
11	0.324	0.55	0.108	1.31			0.387	0.19
12	0.302	0.23	0.092	0.55	0.388	0.39	0.374	0.03
13	0.39	1.54	0.05	-1.42			0.34	-0.39
15	0.26	-0.40	0.05	-1.42	0.32	-0.44		
16	0.268	-0.28	0.0813	0.05			0.377	0.06



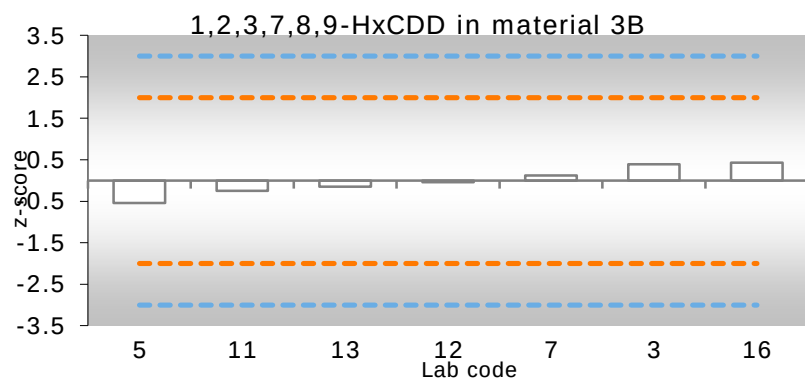
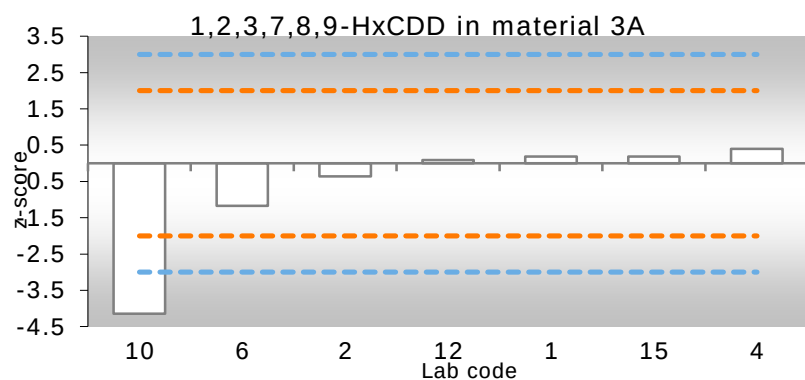
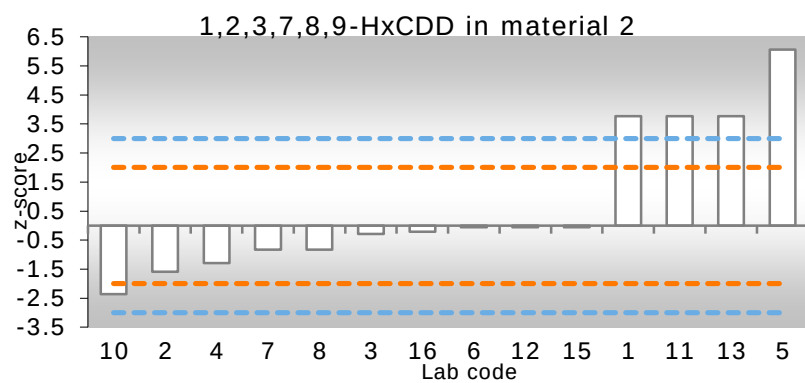
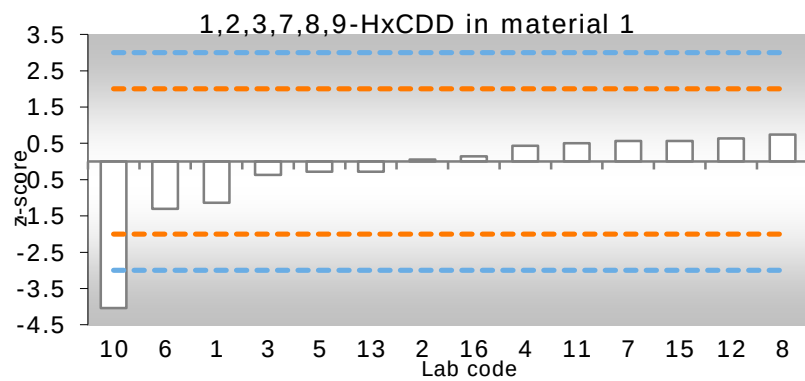
	1,2,3,4,7,8-HxCDD (material 1)		1,2,3,4,7,8-HxCDD (material 2)		1,2,3,4,7,8-HxCDD (material 3a)		1,2,3,4,7,8-HxCDD (material 3b)	
	AV: 0.2718 ng / kg Uncertainty of AV: 0.0125 ng / kg Target sd: 0.0598 ng / kg Robust sd: 0.0373 ng / kg		AV: 0.0527 ng / kg Uncertainty of AV: 0.0102 ng / kg Target sd: 0.0116 ng / kg Robust sd: 0.0305 ng / kg		AV: 0.3191 ng / kg Uncertainty of AV: 0.138 ng / kg Target sd: 0.0702 ng / kg Robust sd: 0.0312 ng / kg		AV: 0.3198 ng / kg Uncertainty of AV: 0.0168 ng / kg Target sd: 0.0704 ng / kg Robust sd: 0.0355 ng / kg	
Lab code	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	0.23	-0.70	0.1	3.06	0.31	-0.13		
2	0.28	0.14	0.03	-1.47	0.33	0.15		
3	0.238	-0.57	0.05	-0.18			0.263	-0.81
4	0.322	0.84	0.048	-0.31	0.386	0.95		
5	0.25	-0.36	0.13	5.00			0.24	-1.13
6	0.22	-0.87	0.05	-0.18	0.3	-0.27		
7	0.26	-0.20	0.04	-0.82			0.32	0.00
8	0.3	0.47	0.02	-2.12	0.34	0.30		
9								
10	0.304525	0.55	0.02	-2.12	0.03	-4.12		
11	0.288	0.27	0.1	3.06			0.322	0.03
12	0.291	0.32	0.04	-0.82	0.333	0.20	0.342	0.32
13	0.23	-0.70	0.1	3.06			0.33	0.14
15	0.28	0.14	0.05	-0.18	0.30	-0.27		
16	0.306	0.57	0.0296	-1.50			0.377	0.81



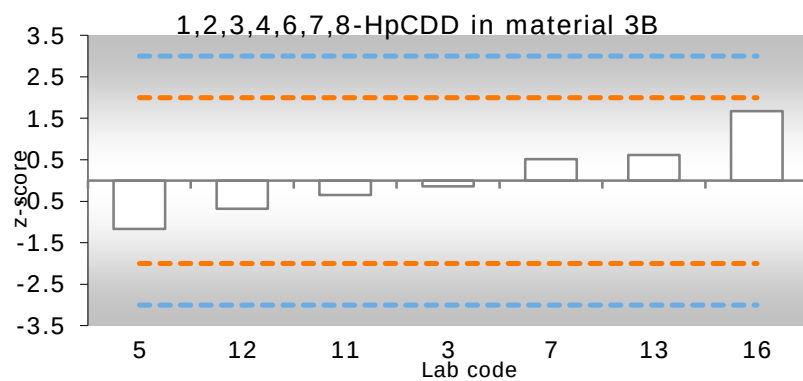
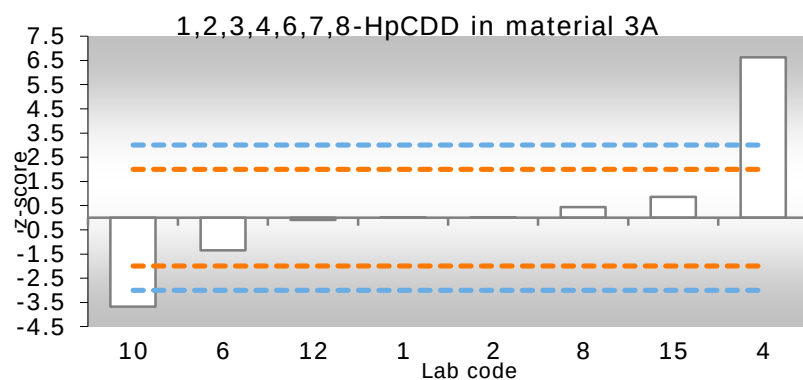
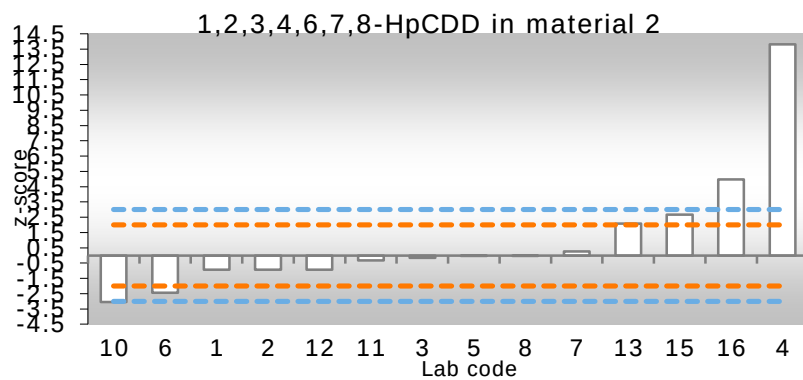
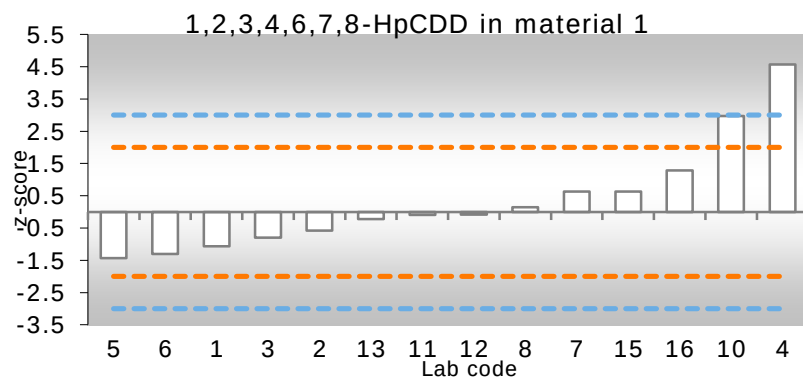
	1,2,3,6,7,8-HxCDD (material 1)		1,2,3,6,7,8- HxCDD (material 2)		1,2,3,6,7,8- HxCDD (material 3a)		1,2,3,6,7,8-HxCDD (material 3b)	
	AV: 0.3202 ng / kg		AV: 0.1208 ng / kg		AV: 0.3615 ng / kg		AV: 0.3761 ng / kg	
	Uncertainty of AV: 0.0238 ng / kg		Uncertainty of AV: 0.0094 ng / kg		Uncertainty of AV: 0.0325 ng / kg		Uncertainty of AV: 0.0182 ng / kg	
	Target sd: 0.0704 ng / kg		Target sd: 0.0266 ng / kg		Target sd: 0.0795 ng / kg		Target sd: 0.0827 ng / kg	
	Robust sd: 0.0713 ng / kg		Robust sd: 0.0281 ng / kg		Robust sd: 0.0735 ng / kg		Robust sd: 0.0384 ng / kg	
Lab code	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	0.25	-0.94	0.11	-0.38	0.32	-0.48		
2	0.28	-0.54	0.09	-1.09	0.35	-0.13		
3	0.25	-0.94	0.123	0.08			0.348	-0.34
4	0.374	0.72	0.125	0.15	0.446	0.98		
5	0.31	-0.14	0.13	0.33			0.33	-0.56
6	0.21	-1.48	0.19	2.46	0.24	-1.41		
7	0.34	0.27	0.12	-0.03			0.37	-0.07
8	0.33	0.13	0.11	-0.38	0.41	0.56		
9								
10	0.46765	1.98	0.20395	2.95	0.51764	1.82		
11	0.441	1.62	0.193	2.56			0.495	1.44
12	0.298	-0.30	0.093	-0.99	0.337	-0.29	0.362	-0.17
13	0.38	0.80	0.1	-0.74			0.47	1.14
15	0.29	-0.41	0.08	-1.45	0.34	-0.25		
16	0.326	0.08	0.133	0.43			0.392	0.19



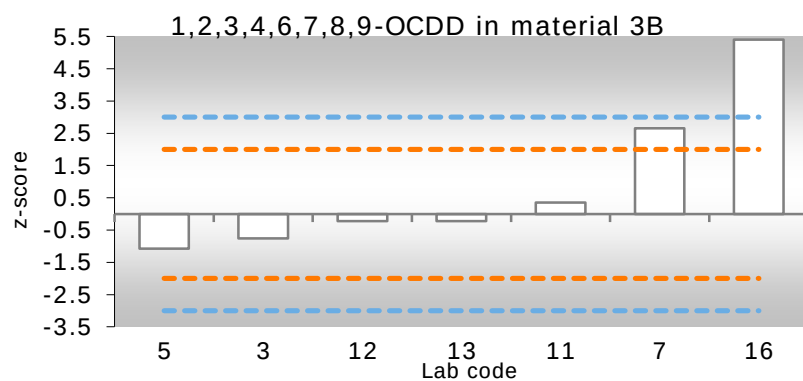
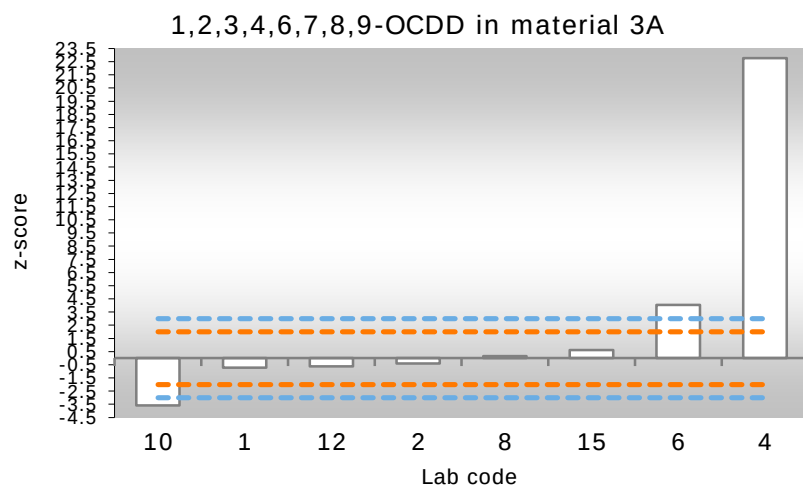
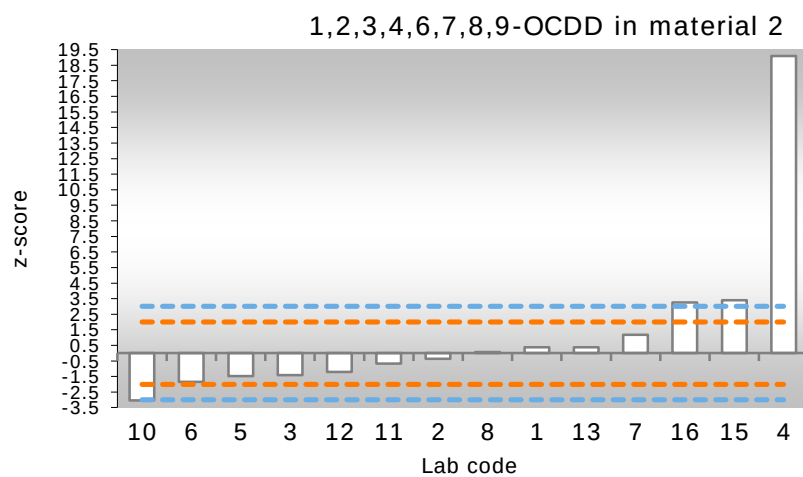
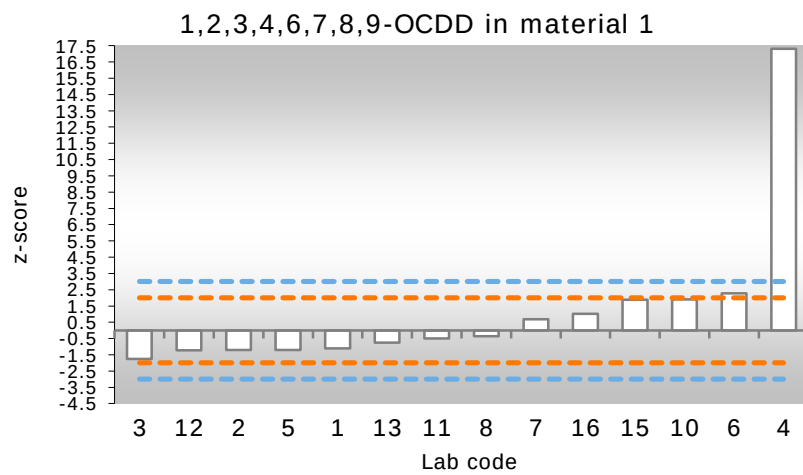
	1,2,3,7,8,9-HxCDD (material 1)		1,2,3,7,8,9- HxCDD (material 2)		1,2,3,7,8,9- HxCDD (material 3a)		1,2,3,7,8,9- HxCDD (material 3b)	
	AV: 0.2666 ng/kg Uncertainty of AV: 0.0137 ng/kg Target sd: 0.0587 ng/kg Robust sd: 0.0411 ng/kg		AV: 0.0508 ng/kg Uncertainty of AV: 0.0068 ng/kg Target sd: 0.0112 ng/kg Robust sd: 0.0202 ng/kg		AV: 0.3366 ng/kg Uncertainty of AV: 0.0144 ng/kg Target sd: 0.0740 ng/kg Robust sd: 0.0327 ng/kg		AV: 0.3409 ng/kg Uncertainty of AV: 0.0135 ng/kg Target sd: 0.0750 ng/kg Robust sd: 0.0287 ng/kg	
Lab code	Result (ng/kg)	z _a -score	Result (ng/kg)	z' _a -score	Result (ng/kg)	z _a -score	Result (ng/kg)	z _a -score
1	0.2	-1.14	0.1	3.77	0.35	0.18		
2	0.27	0.06	0.03	-1.59	0.31	-0.36		
3	0.245	-0.37	0.047	-0.29			0.37	0.39
4	0.292	0.43	0.034	-1.29	0.366	0.40		
5	0.25	-0.28	0.13	6.06			0.3	-0.54
6	0.19	-1.31	0.05	-0.06	0.25	-1.17		
7	0.3	0.57	0.04	-0.83			0.35	0.12
8	0.31	0.74	0.04	-0.83	0.37	0.45		
9								
10	0.03	-4.03	0.02	-2.36	0.03	-4.14		
11	0.296	0.50	0.1	3.77			0.322	-0.25
12	0.304	0.64	0.05	-0.06	0.343	0.09	0.338	-0.04
13	0.25	-0.28	0.1	3.77			0.33	-0.14
15	0.3	0.57	0.05	-0.06	0.35	0.18		
16	0.275	0.14	0.048	-0.21			0.373	0.43



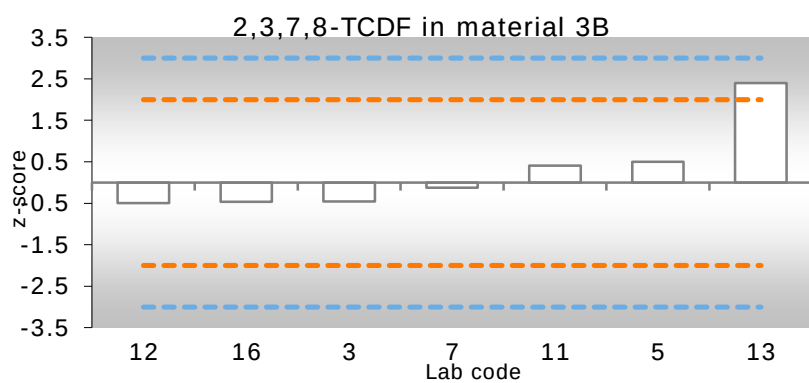
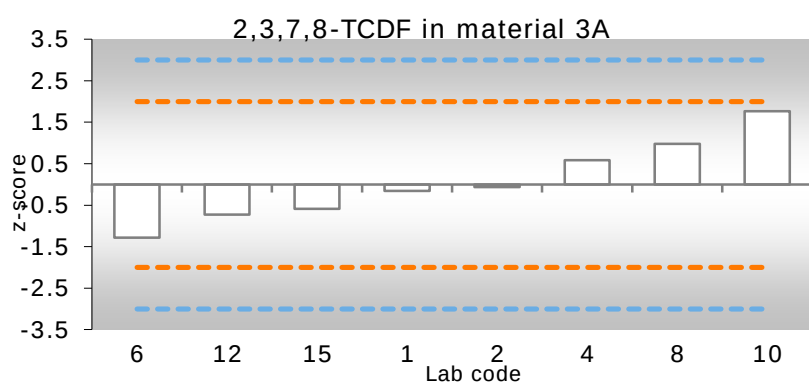
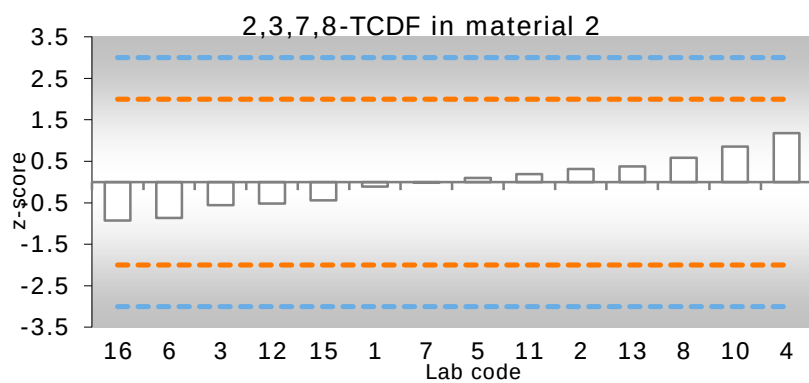
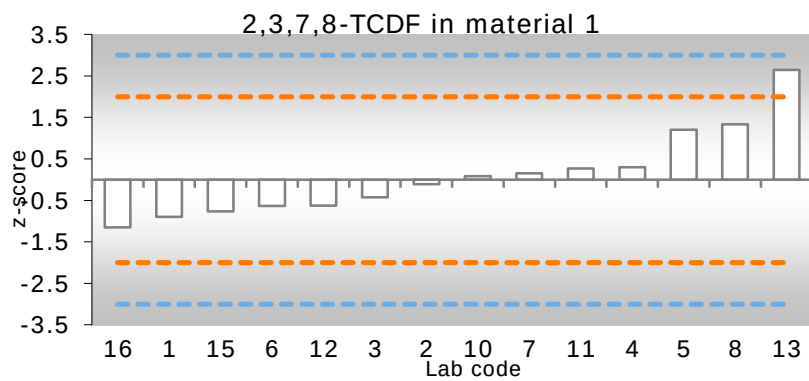
	1,2,3,4,6,7,8-HpCDD (material 1)		1,2,3,4,6,7,8- HpCDD (material 2)		1,2,3,4,6,7,8- HpCDD (material 3a)		1,2,3,4,6,7,8- HpCDD (material 3b)	
	AV: 0.3481 ng / kg Uncertainty of AV: 0.0313 ng / kg Target sd: 0.0766 ng / kg Robust sd: 0.0936 ng / kg		AV: 0.1310 ng / kg Uncertainty of AV: 0.0165 ng / kg Target sd: 0.0288 ng / kg Robust sd: 0.0495 ng / kg		AV: 0.3781 ng / kg Uncertainty of AV: 0.0456 ng / kg Target sd: 0.0832 ng / kg Robust sd: 0.1031 ng / kg		AV: 0.4080 ng / kg Uncertainty of AV: 0.0460 ng / kg Target sd: 0.0898 ng / kg Robust sd: 0.0973 ng / kg	
Lab code	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score
1	0.26	-1.06	0.1	-0.93	0.38	0.02		
2	0.3	-0.58	0.1	-0.93	0.38	0.02		
3	0.282	-0.80	0.126	-0.15			0.394	-0.14
4	0.726	4.57	0.59	13.81	1.007	6.63		
5	0.23	-1.43	0.13	-0.03			0.29	-1.17
6	0.24	-1.31	0.05	-2.44	0.25	-1.35		
7	0.4	0.63	0.14	0.27			0.46	0.52
8	0.36	0.14	0.13	-0.03	0.42	0.44		
9								
10	0.59346	2.97	0.03	-3.04	0.03	-3.67		
11	0.34	-0.10	0.12	-0.33			0.373	-0.35
12	0.341	-0.09	0.1	-0.93	0.37	-0.09	0.339	-0.68
13	0.33	-0.22	0.2	2.08			0.47	0.61
15	0.4	0.63	0.22	2.68	0.46	0.86		
16	0.454	1.28	0.296	4.97			0.577	1.68



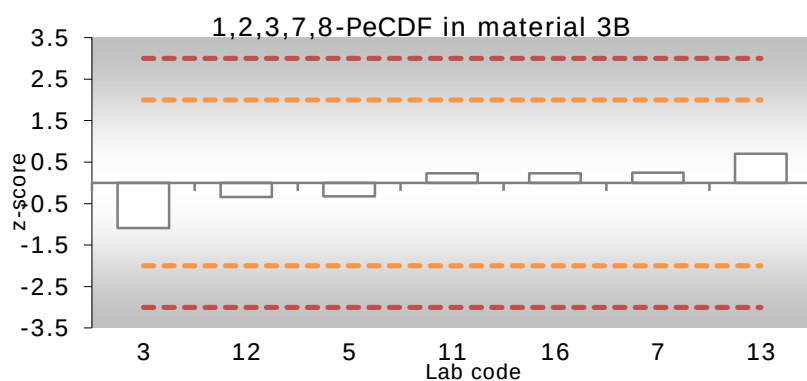
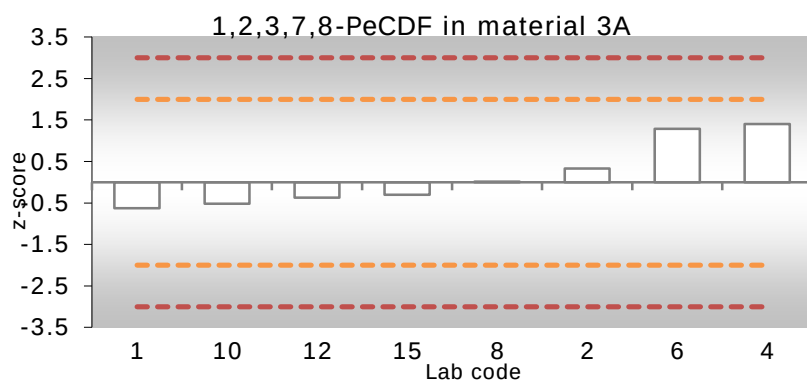
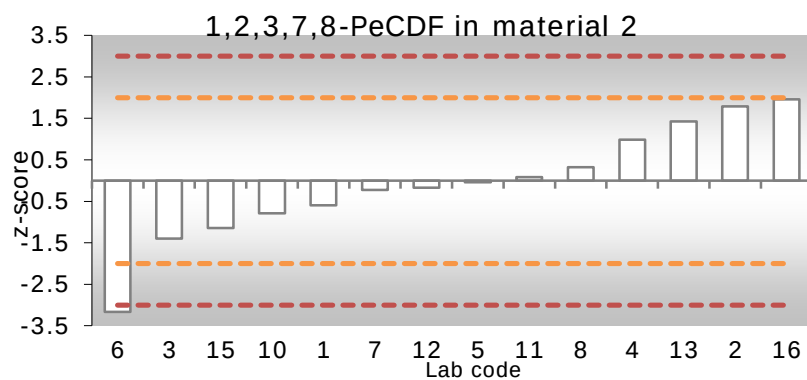
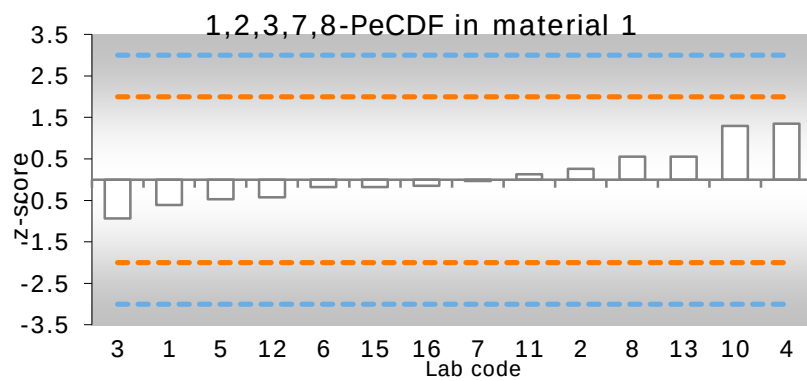
	1,2,3,4,6,7,8,9-OCDD (material 1)		1,2,3,4,6,7,8,9-OCDD (material 2)		1,2,3,4,6,7,8,9-OCDD (material 3a)		1,2,3,4,6,7,8,9-OCDD (material 3b)	
	AV: 0.6920 ng / kg Uncertainty of AV: 0.0863 ng / kg Target sd: 0.1522 ng / kg Robust sd: 0.2584 ng / kg		AV: 0.4499 ng / kg Uncertainty of AV: 0.0922 ng / kg Target sd: 0.0990 ng / kg Robust sd: 0.2760 ng / kg		AV: 0.6152 ng / kg Uncertainty of AV: 0.0807 ng / kg Target sd: 0.1353 ng / kg Robust sd: 0.1827 ng / kg		AV: 0.6241 ng / kg Uncertainty of AV: 0.0673 ng / kg Target sd: 0.1373 ng / kg Robust sd: 0.1424 ng / kg	
Lab code	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score
1	0.5	-1.10	0.5	0.37	0.5	-0.73		
2	0.48	-1.21	0.4	-0.37	0.55	-0.41		
3	0.386	-1.75	0.258	-1.42			0.508	-0.76
4	3.72	17.30	3.032	19.09	4.204	22.77		
5	0.48	-1.21	0.25	-1.48			0.46	-1.07
6	1.09	2.27	0.2	-1.85	1.25	4.03		
7	0.81	0.67	0.61	1.18			1.03	2.66
8	0.63	-0.35	0.46	0.07	0.64	0.16		
9								
10	1.02635	1.91	0.04	-3.03	0.05	-3.59		
11	0.604	-0.50	0.36	-0.66			0.678	0.35
12	0.478	-1.22	0.286	-1.21	0.518	-0.62	0.59	-0.22
13	0.56	-0.75	0.5	0.37			0.59	-0.22
15	1.02	1.87	0.91	3.40	0.71	0.60		
16	0.869	1.01	0.891	3.26			1.45	5.40



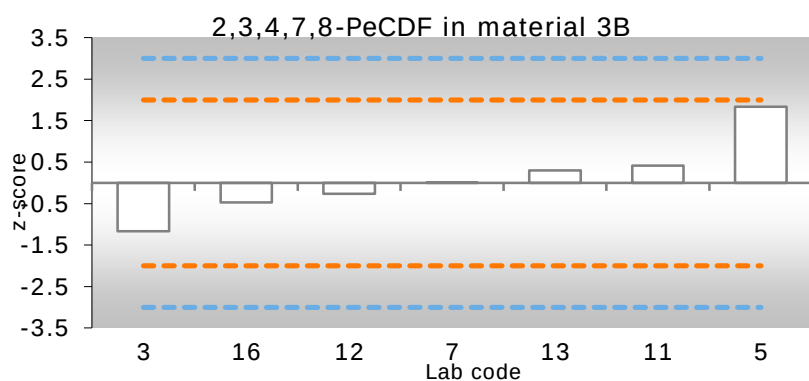
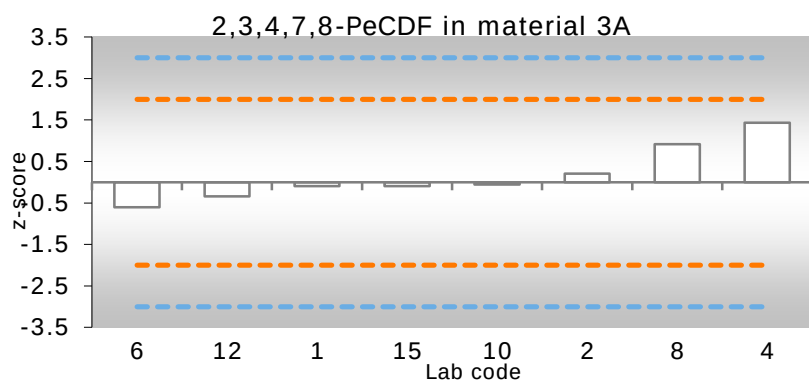
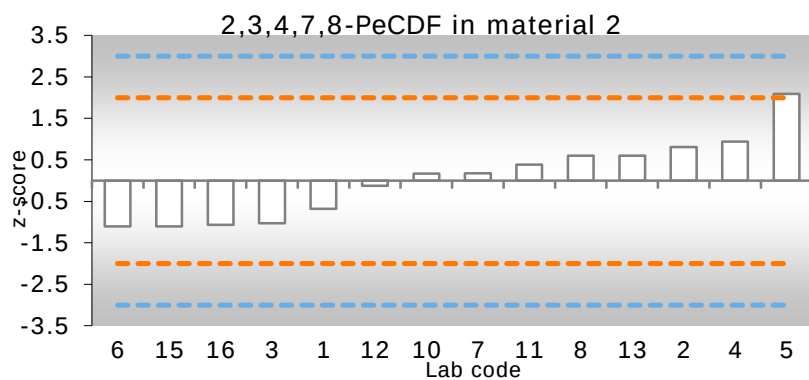
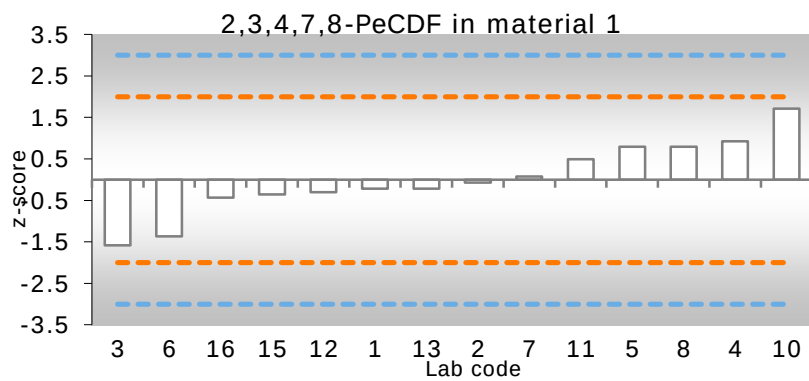
	2,3,7,8-TCDF (material 1)		2,3,7,8-TCDF (material 2)		2,3,7,8-TCDF (material 3a)		2,3,7,8-TCDF (material 3b)	
	AV: 0.3284 ng / kg		AV: 1.5062 ng / kg		AV: 0.4676 ng / kg		AV: 0.4322 ng / kg	
	Uncertainty of AV: 0.0240 ng / kg		Uncertainty of AV: 0.0770 ng / kg		Uncertainty of AV: 0.0521 ng / kg		Uncertainty of AV: 0.0263 ng / kg	
	Target sd: 0.0723 ng / kg		Target sd: 0.3314 ng / kg		Target sd: 0.1029 ng / kg		Target sd: 0.0951 ng / kg	
	Robust sd: 0.0718 ng / kg		Robust sd: 0.2306 ng / kg		Robust sd: 0.1179 ng / kg		Robust sd: 0.0556 ng / kg	
Lab code	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score
1	0.26	-0.90	1.47	-0.11	0.45	-0.15		
2	0.32	-0.11	1.61	0.31	0.46	-0.07		
3	0.296	-0.43	1.322	-0.56			0.389	-0.45
4	0.351	0.30	1.896	1.18	0.535	0.58		
5	0.42	1.20	1.54	0.10			0.48	0.50
6	0.28	-0.64	1.22	-0.86	0.32	-1.28		
7	0.34	0.15	1.5	-0.02			0.42	-0.13
8	0.43	1.33	1.7	0.58	0.58	0.97		
9								
10	0.334705	0.08	1.789405	0.85	0.671075	1.76		
11	0.349	0.27	1.57	0.19			0.471	0.41
12	0.281	-0.62	1.335	-0.52	0.384	-0.73	0.385	-0.50
13	0.53	2.65	1.63	0.37			0.66	2.40
15	0.27	-0.77	1.36	-0.44	0.4	-0.59		
16	0.241	-1.15	1.2	-0.92			0.388	-0.46



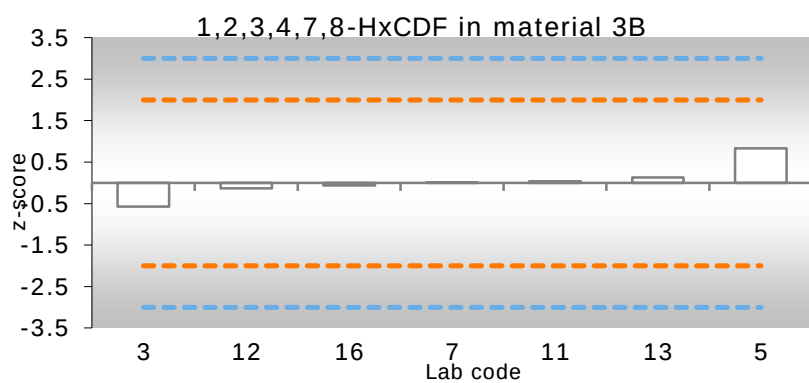
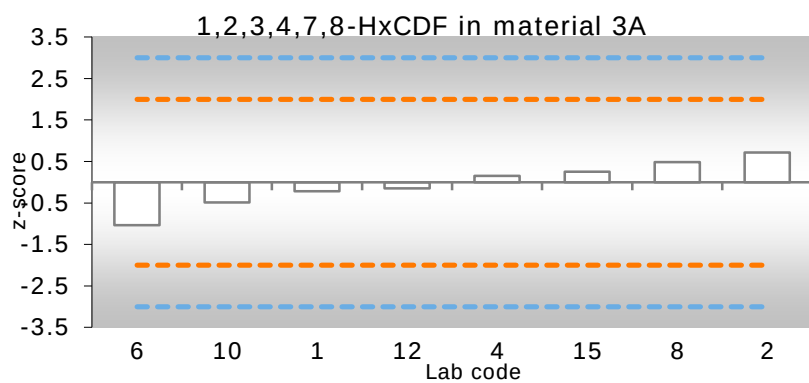
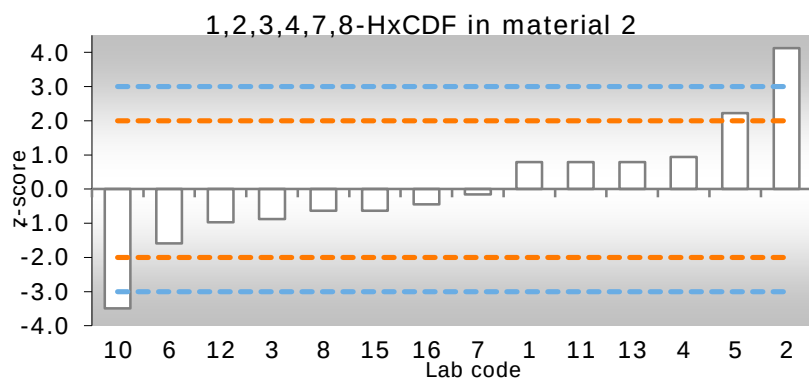
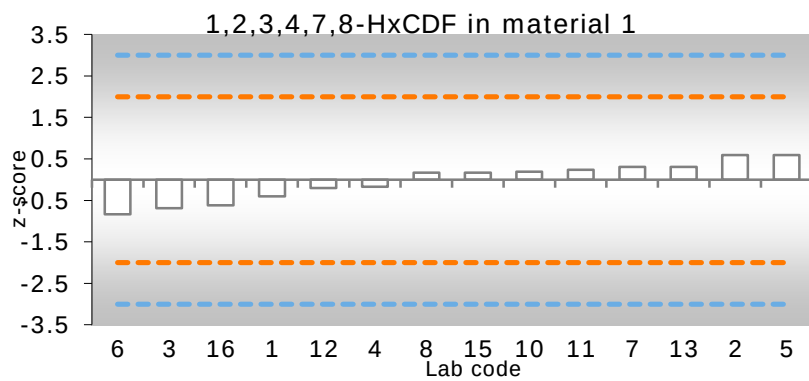
	1,2,3,7,8-PeCDF (material 1)		1,2,3,7,8-PeCDF (material 2)		1,2,3,7,8-PeCDF (material 3a)		1,2,3,7,8-PeCDF (material 3b)	
	AV: 0.3122 ng/kg		AV: 0.2224 ng/kg		AV: 0.4288 ng/kg		AV: 0.3988 ng/kg	
	Uncertainty of AV: 0.0131 ng/kg		Uncertainty of AV: 0.0240 ng/kg		Uncertainty of AV: 0.0265 ng/kg		Uncertainty of AV: 0.0235 ng/kg	
	Target sd: 0.0687 ng/kg		Target sd: 0.0489 ng/kg		Target sd: 0.0943 ng/kg		Target sd: 0.0877 ng/kg	
	Robust sd: 0.0391 ng/kg		Robust sd: 0.0718 ng/kg		Robust sd: 0.0599 ng/kg		Robust sd: 0.0498 ng/kg	
Lab code	Result (ng/kg)	z _a -score	Result (ng/kg)	z' _a -score	Result (ng/kg)	z _a -score	Result (ng/kg)	z _a -score
1	0.27	-0.61	0.19	-0.59	0.37	-0.62		
2	0.33	0.26	0.32	1.79	0.46	0.33		
3	0.248	-0.93	0.146	-1.40			0.303	-1.09
4	0.405	1.35	0.276	0.98	0.561	1.40		
5	0.28	-0.47	0.22	-0.04			0.37	-0.33
6	0.3	-0.18	0.05	-3.16	0.55	1.28		
7	0.31	-0.03	0.21	-0.23			0.42	0.24
8	0.35	0.55	0.24	0.32	0.43	0.01		
9								
10	0.401195	1.30	0.17958	-0.79	0.37989	-0.52		
11	0.321	0.13	0.227	0.08			0.419	0.23
12	0.283	-0.43	0.213	-0.17	0.394	-0.37	0.369	-0.34
13	0.35	0.55	0.3	1.42			0.46	0.70
15	0.3	-0.18	0.16	-1.14	0.4	-0.31		
16	0.302	-0.15	0.329	1.96			0.419	0.23



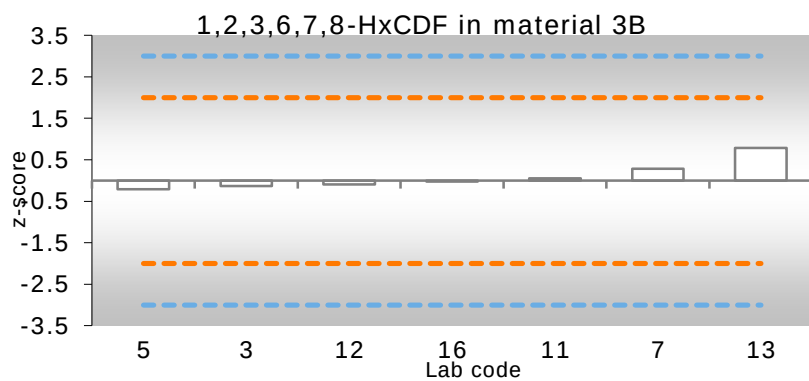
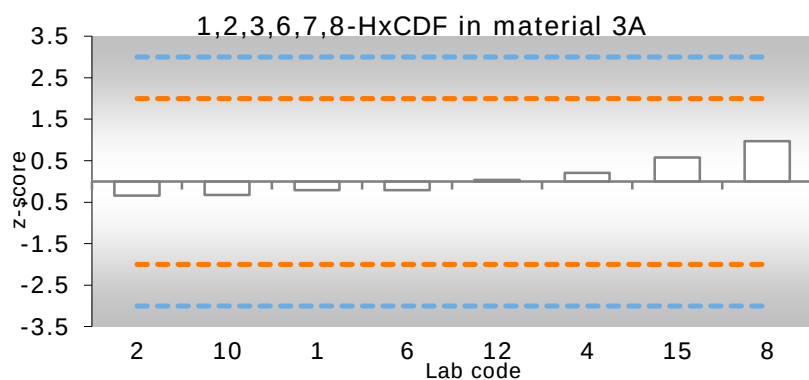
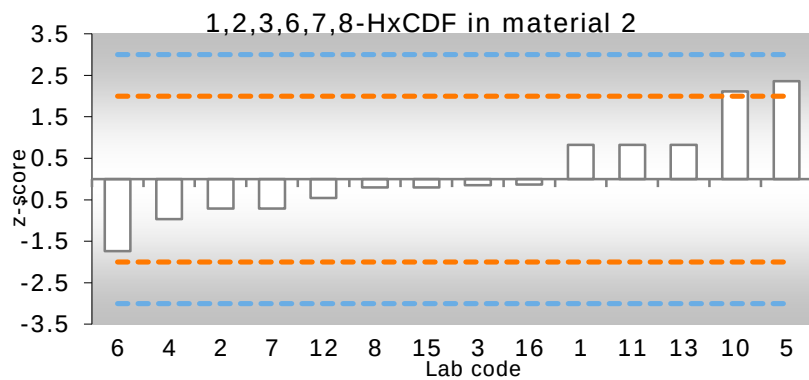
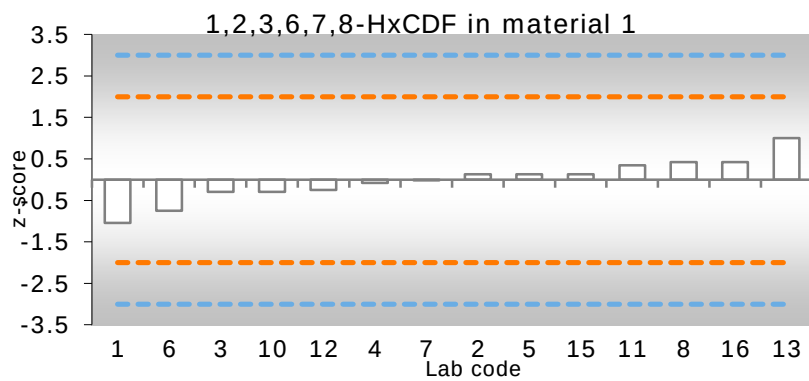
Lab code	2,3,4,7,8-PeCDF (material 1)		2,3,4,7,8-PeCDF (material 2)		2,3,4,7,8-PeCDF (material 3a)		2,3,4,7,8-PeCDF (material 3b)	
	AV: 0.3149 ng / kg		AV: 0.4037 ng / kg		AV: 0.4496 ng / kg		AV: 0.4491 ng / kg	
	Uncertainty of AV: 0.0181 ng / kg		Uncertainty of AV: 0.0311 ng / kg		Uncertainty of AV: 0.0195 ng / kg		Uncertainty of AV: 0.0326 ng / kg	
	Target sd: 0.0693 ng / kg		Target sd: 0.0888 ng / kg		Target sd: 0.0989 ng / kg		Target sd: 0.0988 ng / kg	
	Robust sd: 0.0542 ng / kg		Robust sd: 0.0931 ng / kg		Robust sd: 0.0441 ng / kg		Robust sd: 0.0691 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score
1	0.3	-0.21	0.34	-0.68	0.44	-0.10		
2	0.31	-0.07	0.48	0.81	0.47	0.21		
3	0.205	-1.59	0.307	-1.03			0.328	-1.16
4	0.379	0.93	0.492	0.94	0.591	1.43		
5	0.37	0.80	0.6	2.09			0.64	1.83
6	0.22	-1.37	0.3	-1.10	0.39	-0.60		
7	0.32	0.07	0.42	0.17			0.45	0.01
8	0.37	0.80	0.46	0.60	0.54	0.91		
9								
10	0.433605	1.71	0.41934	0.17	0.44411	-0.06		
11	0.349	0.49	0.44	0.39			0.492	0.41
12	0.294	-0.30	0.392	-0.12	0.416	-0.34	0.422	-0.26
13	0.3	-0.21	0.46	0.60			0.48	0.30
15	0.29	-0.36	0.3	-1.10	0.44	-0.10		
16	0.285	-0.43	0.303	-1.07			0.4	-0.47



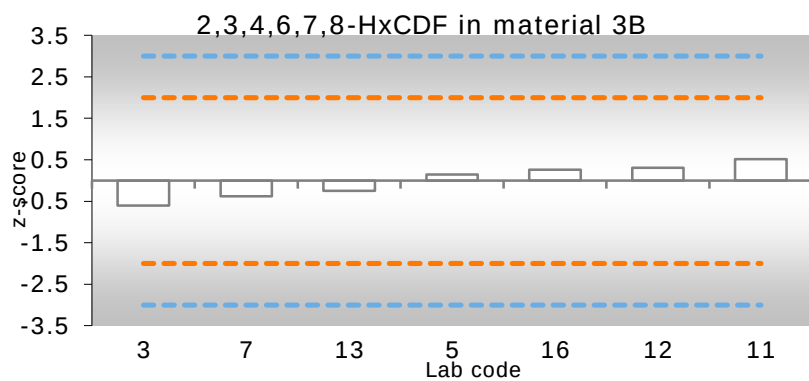
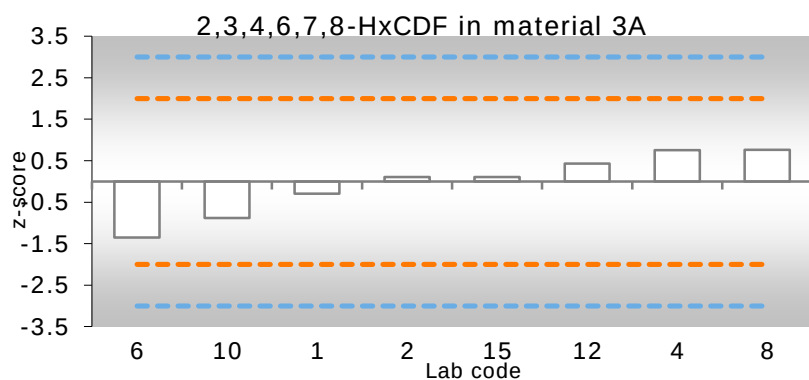
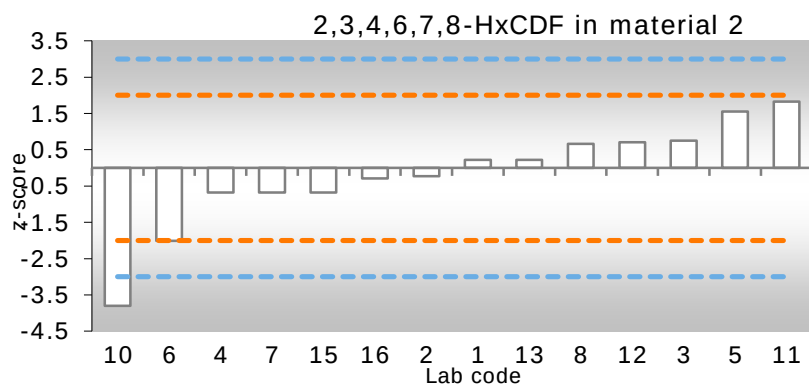
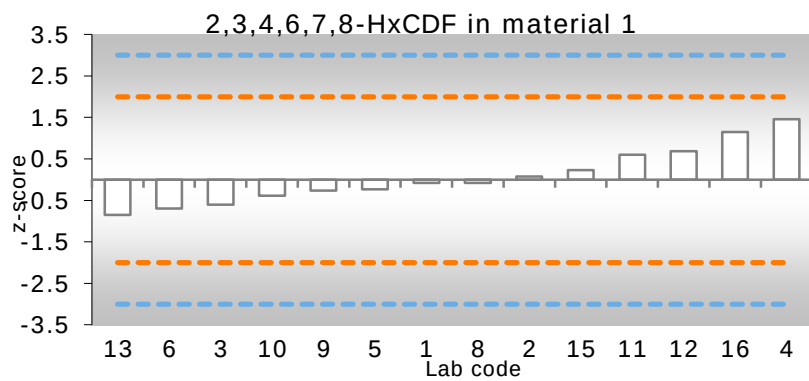
	1,2,3,4,7,8-HxCDF (material 1)		1,2,3,4,7,8- HxCDF (material 2)		1,2,3,4,7,8- HxCDF (material 3a)		1,2,3,4,7,8- HxCDF (material 3b)	
	AV: 0.3183 ng / kg Uncertainty of AV: 0.0115 ng / kg Target sd: 0.0700 ng / kg Robust sd: 0.0343 ng / kg		AV: 0.0833ng / kg Uncertainty of AV: 0.0102 ng / kg Target sd: 0.0183 ng / kg Robust sd: 0.0306 ng / kg		AV: 0.3887 ng / kg Uncertainty of AV: 0.0217 ng / kg Target sd: 0.0855 ng / kg Robust sd: 0.0492 ng / kg		AV: 0.3891 ng / kg Uncertainty of AV: 0.0076 ng / kg Target sd: 0.0856 ng / kg Robust sd: 0.0160 ng / kg	
Lab code	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	0.29	-0.40	0.1	0.79	0.37	-0.22		
2	0.36	0.60	0.17	4.13	0.45	0.72		
3	0.27	-0.69	0.065	-0.87			0.34	-0.57
4	0.306	-0.18	0.103	0.94	0.402	0.16		
5	0.36	0.60	0.13	2.22			0.46	0.83
6	0.26	-0.83	0.05	-1.59	0.3	-1.04		
7	0.34	0.31	0.08	-0.16			0.39	0.01
8	0.33	0.17	0.07	-0.63	0.43	0.48		
9								
10	0.331415	0.19	0.01	-3.49	0.34671	-0.49		
11	0.335	0.24	0.1	0.79			0.392	0.03
12	0.304	-0.20	0.063	-0.97	0.376	-0.15	0.378	-0.13
13	0.34	0.31	0.1	0.79			0.4	0.13
15	0.33	0.17	0.07	-0.63	0.41	0.25		
16	0.275	-0.62	0.0739	-0.45			0.384	-0.06



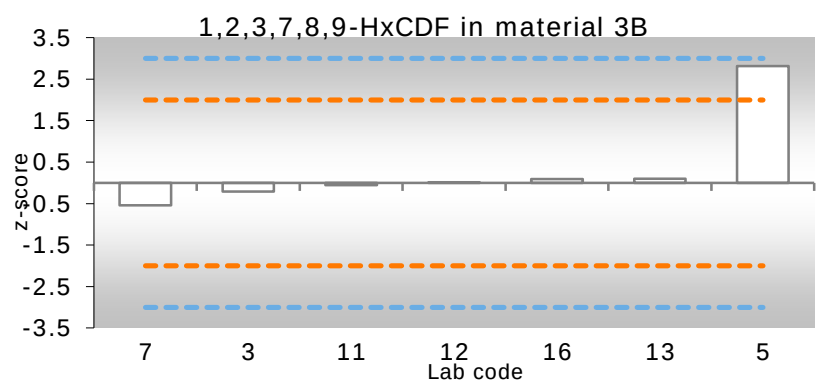
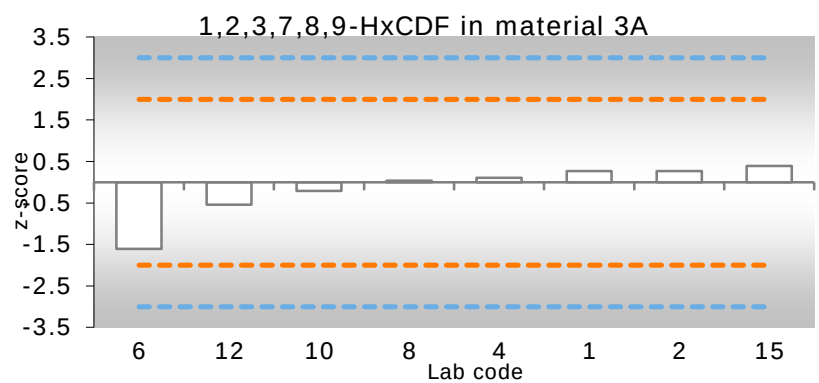
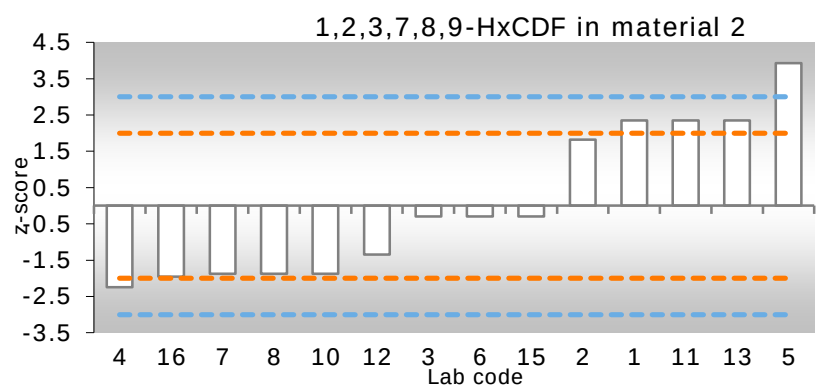
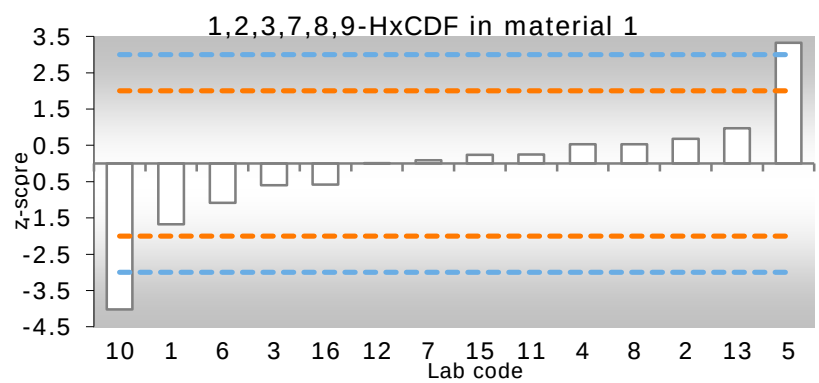
	1,2,3,6,7,8-HxCDF (material 1)		1,2,3,6,7,8- HxCDF (material 2)		1,2,3,6,7,8- HxCDF (material 3a)		1,2,3,6,7,8- HxCDF (material 3b)	
	AV: 0.3113 ng/kg Uncertainty of AV: 0.0104 ng/kg Target sd: 0.0685 ng/kg Robust sd: 0.0311 ng/kg		AV: 0.0839 ng/kg Uncertainty of AV: 0.0064 ng/kg Target sd: 0.0185 ng/kg Robust sd: 0.0192 ng/kg		AV: 0.3462 ng/kg Uncertainty of AV: 0.0125 ng/kg Target sd: 0.0762 ng/kg Robust sd: 0.0283 ng/kg		AV: 0.3669 ng/kg Uncertainty of AV: 0.0073 ng/kg Target sd: 0.0807 ng/kg Robust sd: 0.0154 ng/kg	
Lab code	Result (ng/kg)	z _a -score	Result (ng/kg)	z' _a -score	Result (ng/kg)	z _a -score	Result (ng/kg)	z _a -score
1	0.24	-1.04	0.1	0.82	0.33	-0.21		
2	0.32	0.13	0.07	-0.71	0.32	-0.34		
3	0.291	-0.30	0.081	-0.15			0.356	-0.13
4	0.306	-0.08	0.065	-0.97	0.362	0.21		
5	0.32	0.13	0.13	2.36			0.35	-0.21
6	0.26	-0.75	0.05	-1.74	0.33	-0.21		
7	0.31	-0.02	0.07	-0.71			0.39	0.29
8	0.34	0.42	0.08	-0.20	0.42	0.97		
9								
10	0.291275	-0.29	0.12521	2.11	0.321635	-0.32		
11	0.335	0.35	0.1	0.82			0.371	0.05
12	0.294	-0.25	0.075	-0.46	0.349	0.04	0.359	-0.10
13	0.38	1.00	0.1	0.82			0.43	0.78
15	0.32	0.13	0.08	-0.20	0.39	0.58		
16	0.34	0.42	0.0813	-0.14			0.365	-0.02



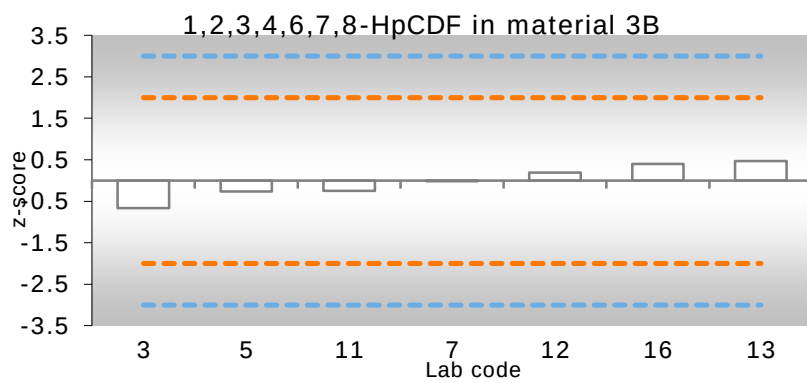
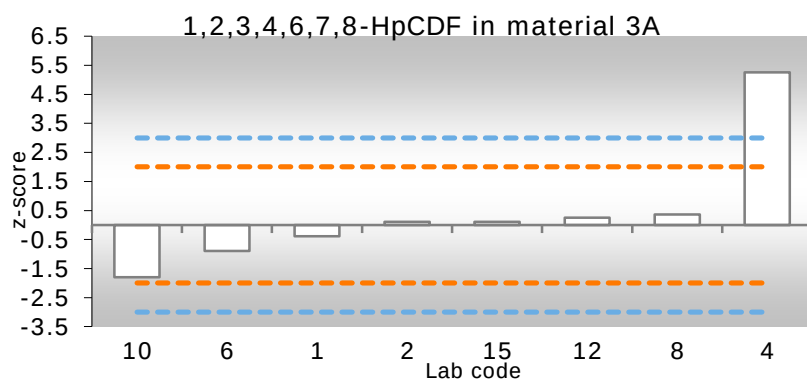
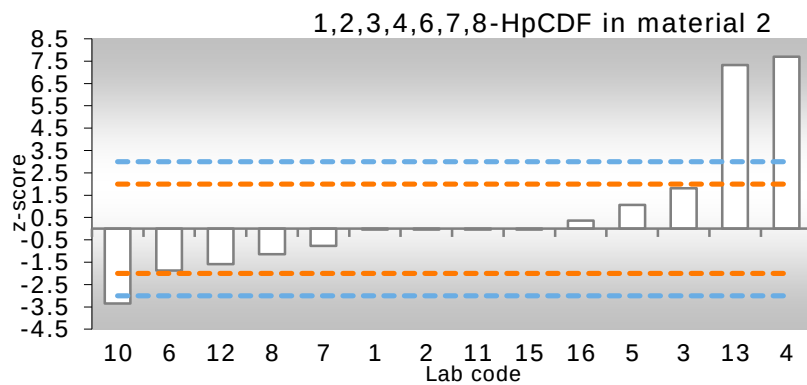
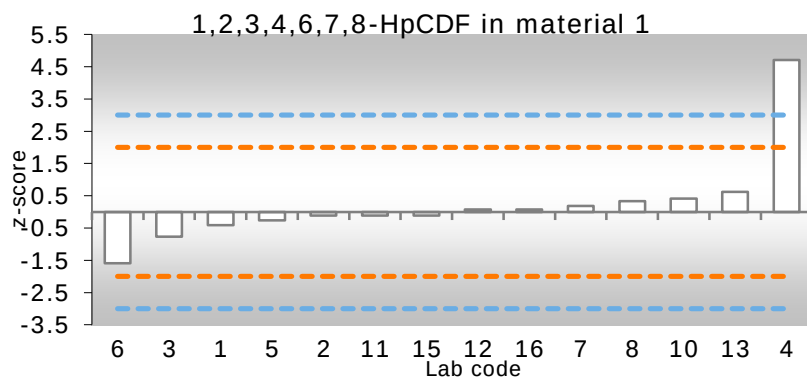
2,3,4,6,7,8-HxCDF (material 1)			2,3,4,6,7,8-HxCDF (material 2)		2,3,4,6,7,8-HxCDF (material 3a)		2,3,4,6,7,8-HxCDF (material 3b)	
AV: 0.2953 ng / kg Uncertainty of AV: 0.0140 ng / kg Target sd: 0.0650 ng / kg Robust sd: 0.0418 ng / kg			AV: 0.0951 ng / kg Uncertainty of AV: 0.0080 ng / kg Target sd: 0.0209 ng / kg Robust sd: 0.0241 ng / kg		AV: 0.3222 ng / kg Uncertainty of AV: 0.0263 ng / kg Target sd: 0.0709 ng / kg Robust sd: 0.0594 ng / kg		AV: 0.3491 ng / kg Uncertainty of AV: 0.0175 ng / kg Target sd: 0.0768 ng / kg Robust sd: 0.0370 ng / kg	
Lab code	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Lab code	Result (ng / kg)	z _a -score	Result (ng / kg)
1	0.25	-0.70	0.1	0.22	0.3	-0.29		
2	0.29	-0.08	0.09	-0.23	0.33	0.10		
3	0.256	-0.60	0.112	0.75			0.303	-0.60
4	0.31	0.23	0.08	-0.67	0.379	0.75		
5	0.37	1.15	0.13	1.56			0.36	0.14
6	0.24	-0.85	0.05	-2.01	0.22	-1.35		
7	0.3	0.07	0.08	-0.67			0.32	-0.38
8	0.34	0.69	0.11	0.66	0.38	0.76		
9								
10	0.38965	1.45	0.01	-3.80	0.255785	-0.88		
11	0.334	0.60	0.136	1.82			0.389	0.52
12	0.29	-0.08	0.111	0.71	0.355	0.43	0.373	0.31
13	0.28	-0.24	0.1	0.22			0.33	-0.25
15	0.27	-0.39	0.08	-0.67	0.33	0.10		
16	0.278	-0.27	0.0887	-0.29			0.369	0.26



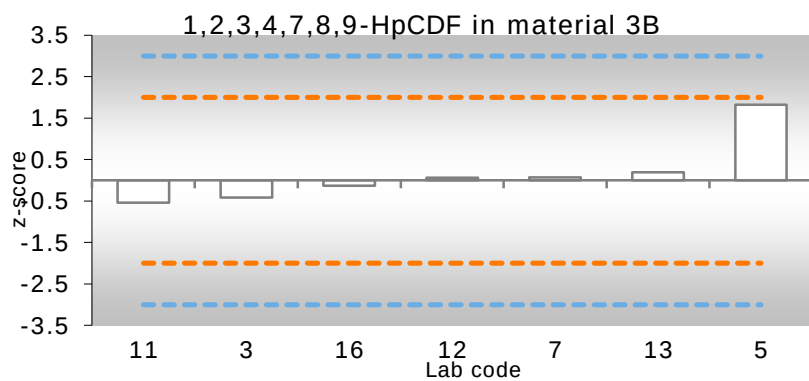
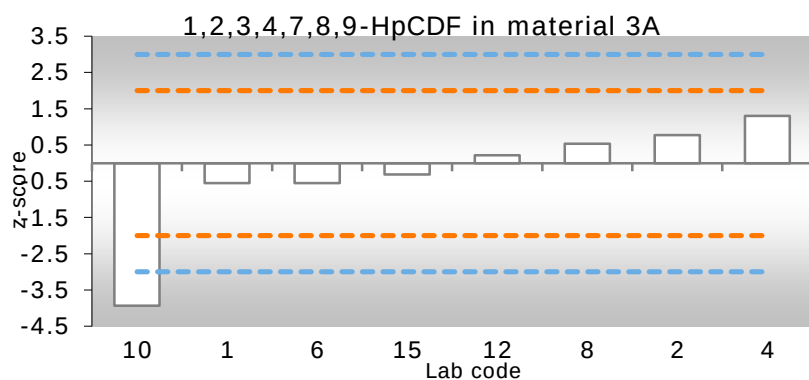
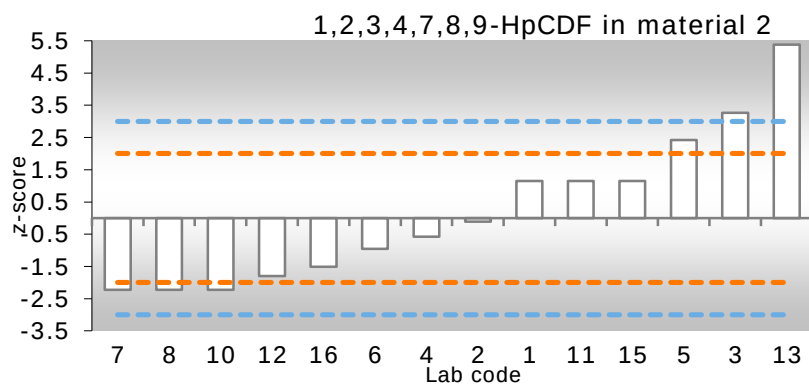
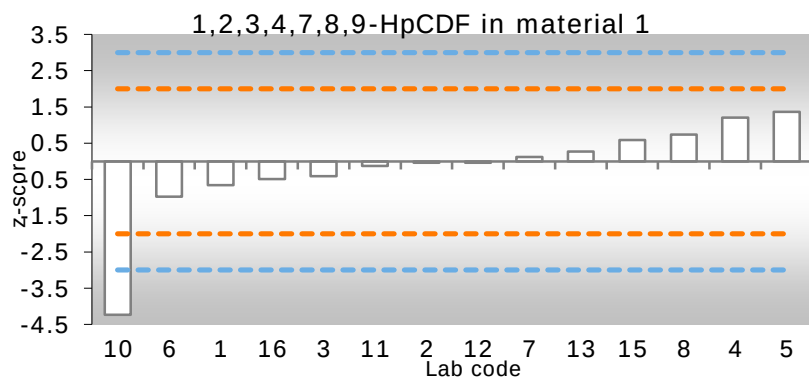
	1,2,3,7,8,9-HxCDF (material 1)		1,2,3,7,8,9-HxCDF (material 2)		1,2,3,7,8,9-HxCDF (material 3a)		1,2,3,7,8,9-HxCDF (material 3b)	
	AV: 0.2939 ng/kg Uncertainty of AV: 0.0214 ng/kg Target sd: 0.0647 ng/kg Robust sd: 0.0639 ng/kg		AV: 0.0555 ng/kg Uncertainty of AV: 0.0145 ng/kg Target sd: 0.0122 ng/kg Robust sd: 0.0434 ng/kg		AV: 0.3869 ng/kg Uncertainty of AV: 0.0141 ng/kg Target sd: 0.0851 ng/kg Robust sd: 0.0320 ng/kg		AV: 0.3521 ng/kg Uncertainty of AV: 0.0061 ng/kg Target sd: 0.0775 ng/kg Robust sd: 0.0129 ng/kg	
Lab code	Result (ng/kg)	z' _a -score	Result (ng/kg)	z' _a -score	Result (ng/kg)	z _a -score	Result (ng/kg)	z _a -score
1	0.18	-1.67	0.1	2.35	0.41	0.27		
2	0.34	0.68	0.09	1.82	0.41	0.27		
3	0.253	-0.60	0.05	-0.29			0.336	-0.21
4	0.33	0.53	0.013	-2.24	0.396	0.11		
5	0.52	3.32	0.13	3.93			0.57	2.81
6	0.22	-1.08	0.05	-0.29	0.25	-1.61		
7	0.3	0.09	0.02	-1.87			0.31	-0.54
8	0.33	0.53	0.02	-1.87	0.39	0.04		
9								
10	0.02	-4.02	0.02	-1.87	0.368785	-0.21		
11	0.311	0.25	0.1	2.35			0.348	-0.05
12	0.294	0.00	0.03	-1.35	0.341	-0.54	0.353	0.01
13	0.36	0.97	0.1	2.35			0.36	0.10
15	0.31	0.24	0.05	-0.29	0.42	0.39		
16	0.254	-0.59	0.0185	-1.95			0.359	0.09



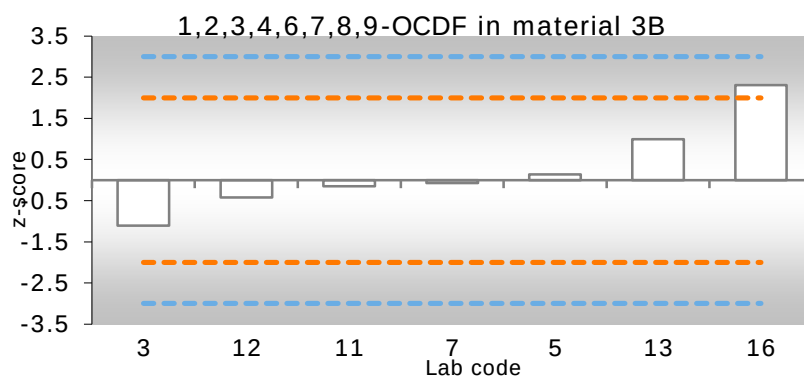
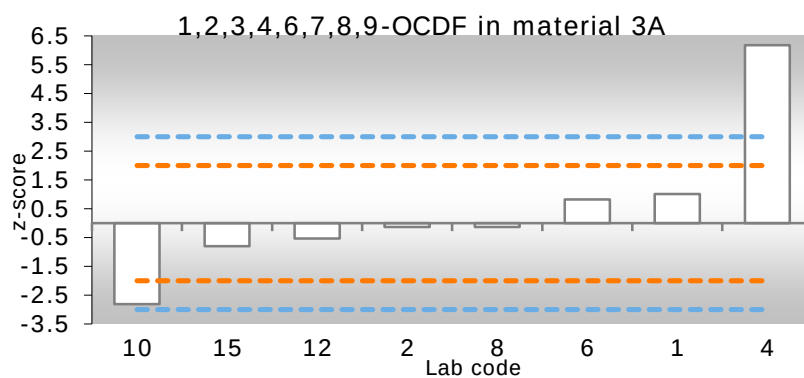
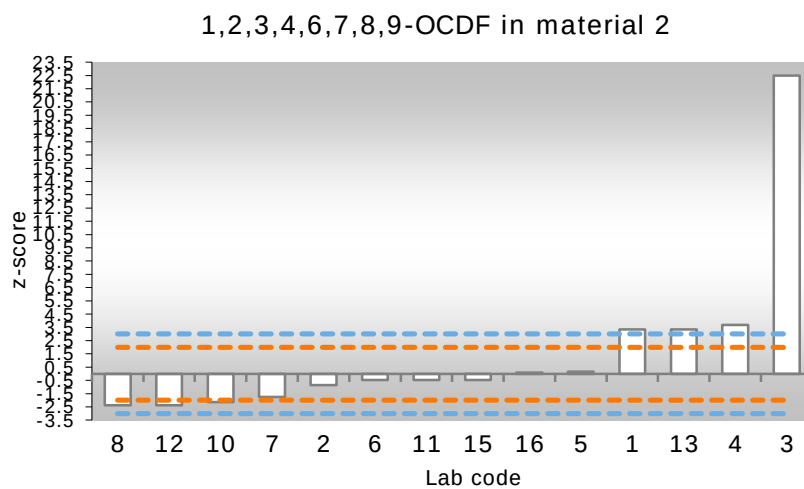
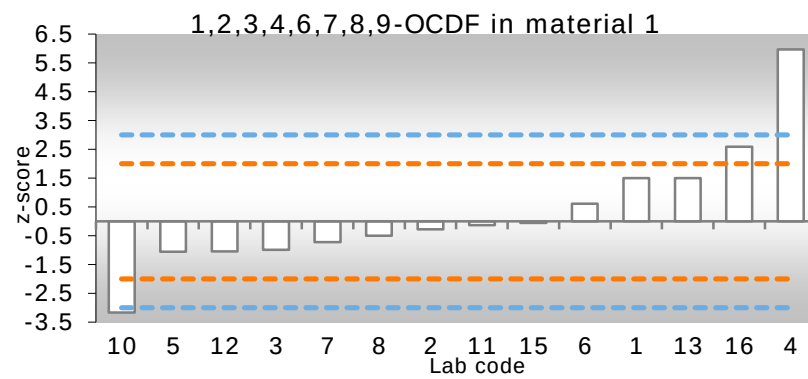
Lab code	1,2,3,4,6,7,8-HpCDF (material 1)		1,2,3,4,6,7,8-HpCDF (material 2)		1,2,3,4,6,7,8-HpCDF (material 3a)		1,2,3,4,6,7,8-HpCDF (material 3b)	
	AV: 0.3077 ng / kg		AV: 0.1009 ng / kg		AV: 0.3610 ng / kg		AV: 0.3715 ng / kg	
	Uncertainty of AV: 0.0107 ng / kg		Uncertainty of AV: 0.0156 ng / kg		Uncertainty of AV: 0.0222 ng / kg		Uncertainty of AV: 0.0167 ng / kg	
	Target sd: 0.0677 ng / kg		Target sd: 0.0222 ng / kg		Target sd: 0.0794 ng / kg		Target sd: 0.0817 ng / kg	
	Robust sd: 0.0321 ng / kg		Robust sd: 0.0468 ng / kg		Robust sd: 0.0503 ng / kg		Robust sd: 0.0354 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	0.28	-0.41	0.1	-0.03	0.33	-0.39		
2	0.3	-0.11	0.1	-0.03	0.37	0.11		
3	0.256	-0.76	0.15	1.81			0.317	-0.67
4	0.626	4.70	0.31	7.70	0.778	5.25		
5	0.29	-0.26	0.13	1.07			0.35	-0.26
6	0.2	-1.59	0.05	-1.88	0.29	-0.89		
7	0.32	0.18	0.08	-0.77			0.37	-0.02
8	0.33	0.33	0.07	-1.14	0.39	0.37		
9								
10	0.33564	0.41	0.01	-3.35	0.218105	-1.80		
11	0.3	-0.11	0.1	-0.03			0.351	-0.25
12	0.313	0.08	0.058	-1.58	0.381	0.25	0.387	0.19
13	0.35	0.63	0.3	7.33			0.41	0.47
15	0.3	-0.11	0.1	-0.03	0.37	0.11		
16	0.313	0.08	0.111	0.37			0.404	0.40



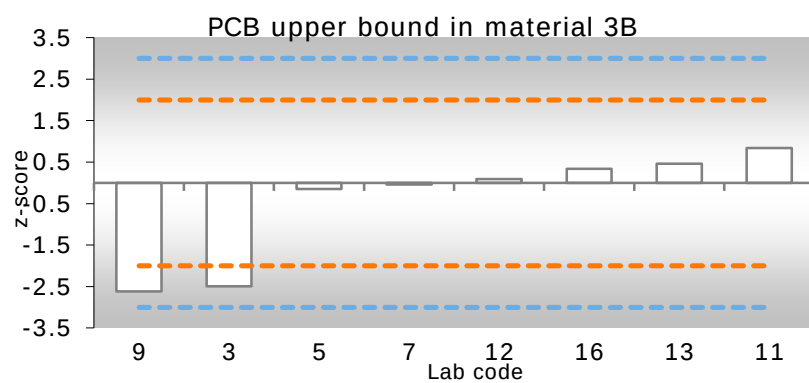
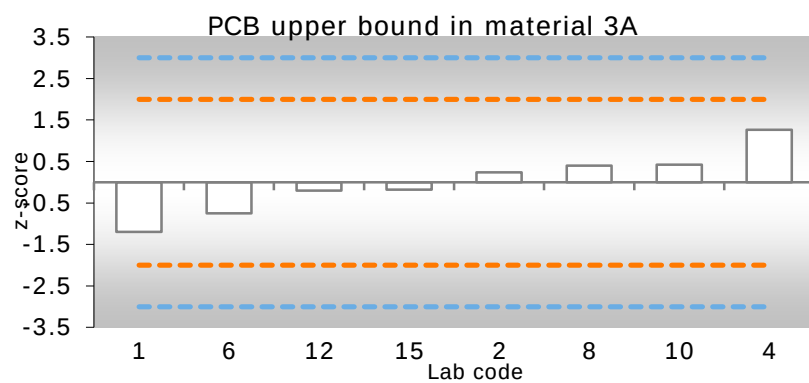
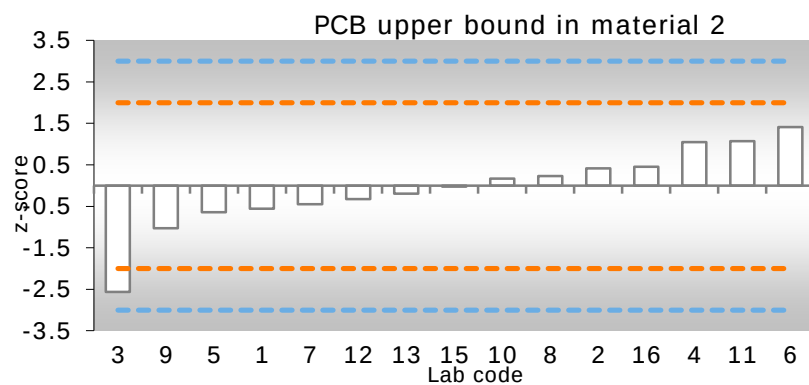
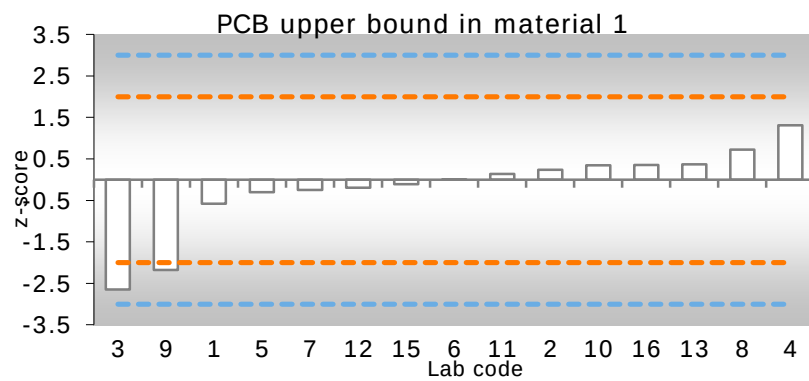
	1,2,3,4,7,8,9-HpCDF (material 1)		1,2,3,4,7,8,9-HpCDF (material 2)		1,2,3,4,7,8,9-HpCDF (material 3a)		1,2,3,4,7,8,9-HpCDF (material 3b)	
	AV: 0.2925 ng / kg		AV: 0.0727 ng / kg		AV: 0.3460 ng / kg		AV: 0.3642 ng / kg	
	Uncertainty of AV: 0.0177 ng / kg		Uncertainty of AV: 0.0175 ng / kg		Uncertainty of AV: 0.0330 ng / kg		Uncertainty of AV: 0.0125 ng / kg	
	Target sd: 0.0643 ng / kg		Target sd: 0.0160 ng / kg		Target sd: 0.0761 ng / kg		Target sd: 0.0801 ng / kg	
	Robust sd: 0.0530 ng / kg		Robust sd: 0.0523 ng / kg		Robust sd: 0.0748 ng / kg		Robust sd: 0.0264 ng / kg	
Lab code	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score
1	0.25	-0.66	0.1	1.15	0.3	-0.55		
2	0.29	-0.04	0.07	-0.11	0.41	0.77		
3	0.266	-0.41	0.15	3.27			0.331	-0.41
4	0.37	1.20	0.059	-0.58	0.454	1.30		
5	0.38	1.36	0.13	2.42			0.51	1.82
6	0.23	-0.97	0.05	-0.96	0.3	-0.55		
7	0.3	0.12	0.02	-2.22			0.37	0.07
8	0.34	0.74	0.02	-2.22	0.39	0.53		
9								
10	0.02	-4.23	0.02	-2.22	0.02	-3.93		
11	0.284	-0.13	0.1	1.15			0.321	-0.54
12	0.29	-0.04	0.03	-1.80	0.364	0.22	0.369	0.06
13	0.31	0.27	0.2	5.38			0.38	0.20
15	0.33	0.58	0.1	1.15	0.32	-0.31		
16	0.261	-0.49	0.037	-1.51			0.354	-0.13



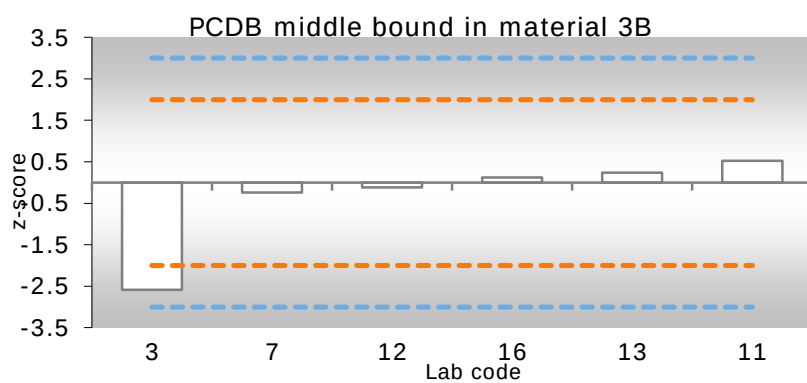
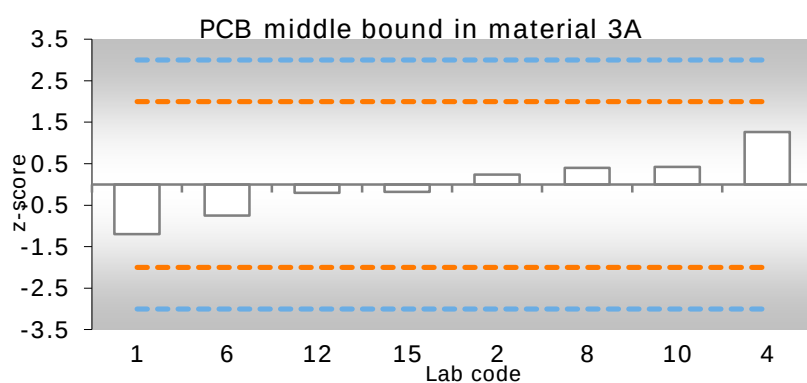
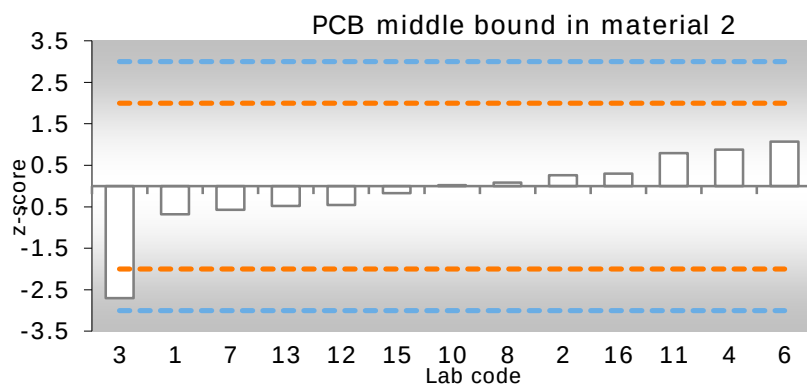
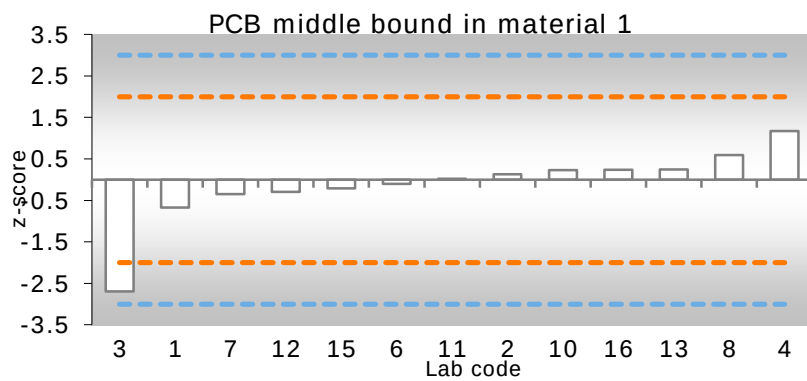
	1,2,3,4,6,7,8,9-OCDF (material 1)		1,2,3,4,6,7,8,9-OCDF (material 2)		1,2,3,4,6,7,8,9-OCDF (material 3a)		1,2,3,4,6,7,8,9-OCDF (material 3b)	
	AV: 0.3652 ng / kg Uncertainty of AV: 0.0402 ng / kg Target sd: 0.0804 ng / kg Robust sd: 0.1204 ng / kg		AV: 0.2371 ng / kg Uncertainty of AV: 0.0585 ng / kg Target sd: 0.0522 ng / kg Robust sd: 0.1750 ng / kg		AV: 0.3941 ng / kg Uncertainty of AV: 0.0585 ng / kg Target sd: 0.0867 ng / kg Robust sd: 0.1323 ng / kg		AV: 0.4068 ng / kg Uncertainty of AV: 0.0277 ng / kg Target sd: 0.0895 ng / kg Robust sd: 0.0568 ng / kg	
Lab code	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score
1	0.5	1.50	0.5	3.35	0.5	1.01		
2	0.34	-0.28	0.17	-0.86	0.38	-0.14		
3	0.276	-0.99	2	22.50			0.303	-1.11
4	0.901	5.96	0.526	3.69	1.04	6.18		
5	0.27	-1.06	0.25	0.16			0.42	0.14
6	0.42	0.61	0.2	-0.47	0.48	0.82		
7	0.3	-0.73	0.10	-1.75			0.4	-0.07
8	0.32	-0.50	0.05	-2.39	0.38	-0.14		
9								
10	0.08	-3.17	0.07	-2.13	0.1	-2.81		
11	0.353	-0.14	0.2	-0.47			0.393	-0.15
12	0.271	-1.05	0.05	-2.39	0.338	-0.54	0.367	-0.43
13	0.5	1.50	0.5	3.35			0.5	0.99
15	0.36	-0.06	0.2	-0.47	0.31	-0.80		
16	0.598	2.59	0.244	0.09			0.623	2.31



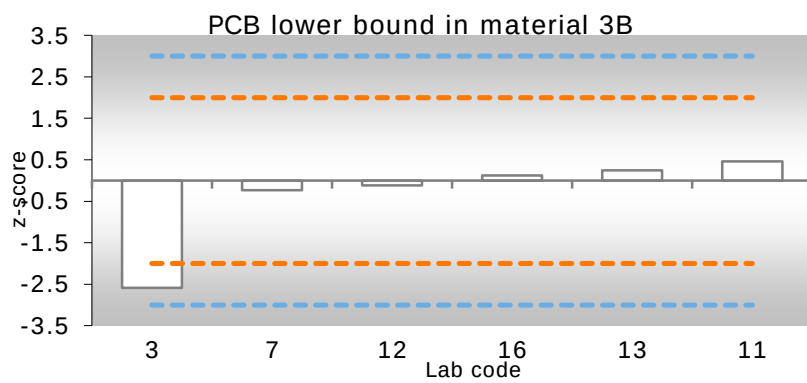
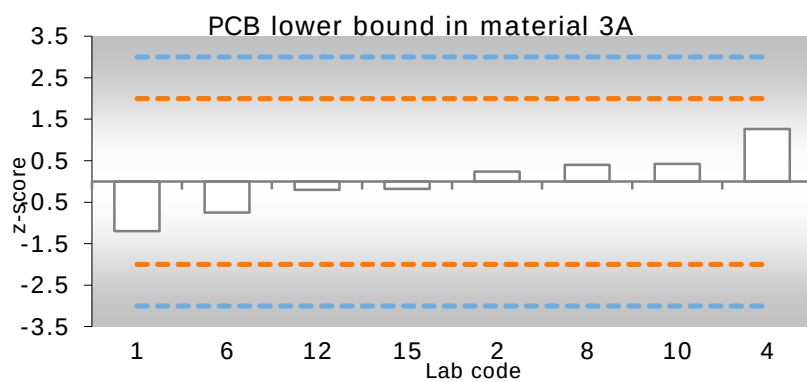
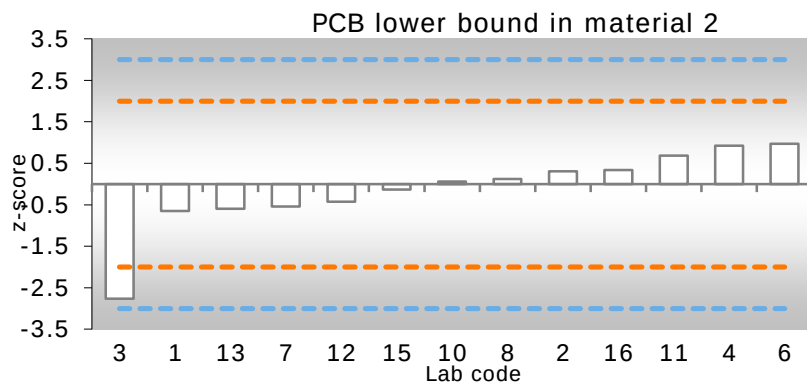
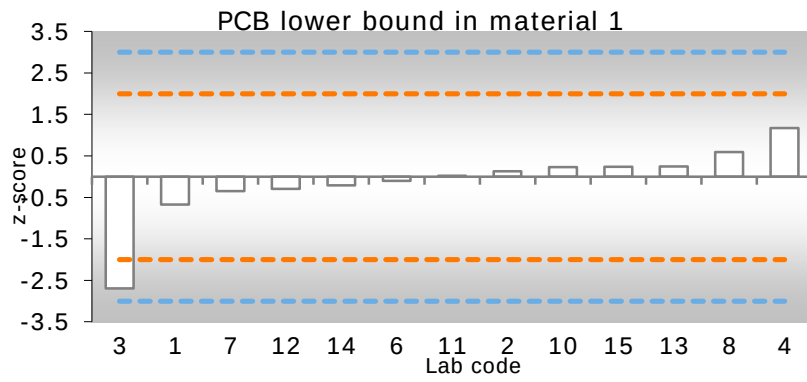
Lab code	PCB ub (material 1)		PCB ub (material 2)		PCB ub (material 3a)		PCB ub (material 3b)	
	AV: 0.77 ng / kg		AV: 0.87 ng / kg		AV: 1.96 ng / kg		AV: 1.81 ng / kg	
	Uncertainty of AV: 0.03 ng / kg		Uncertainty of AV: 0.05 ng / kg		Uncertainty of AV: 0.13 ng / kg		Uncertainty of AV: 0.11 ng / kg	
	Target sd: 0.17 ng / kg		Target sd: 0.19 ng / kg		Target sd: 0.43 ng / kg		Target sd: 0.40 ng / kg	
	Robust sd: 0.09 ng / kg		Robust sd: 0.15 ng / kg		Robust sd: 0.29 ng / kg		Robust sd: 0.26 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	0.67	-0.58	0.76	-0.56	1.44	-1.20		
2	0.809	0.24	0.946	0.42	2.06	0.24		
3	0.321	-2.65	0.3784	-2.56			0.8189	-2.49
4	0.99	1.31	1.066	1.05	2.501	1.26		
5	0.717	-0.30	0.744	-0.64			1.754	-0.15
6	0.769	0.00	1.135	1.41	1.634	-0.75		
7	0.726	-0.25	0.781	-0.45			1.8	-0.04
8	0.89	0.72	0.91	0.23	2.13	0.40		
9	0.4	-2.18	0.67	-1.03			0.77	-2.62
10	0.827274225	0.35	0.8987316	0.17	2.13916215	0.42		
11	0.791	0.13	1.07	1.07			2.15	0.84
12	0.736	-0.19	0.804	-0.33	1.87	-0.20	1.85	0.09
13	0.83	0.36	0.83	-0.19			2	0.46
15	0.75	-0.11	0.861	-0.03	1.88	-0.18		
16	0.828	0.35	0.953	0.45			1.95	0.34



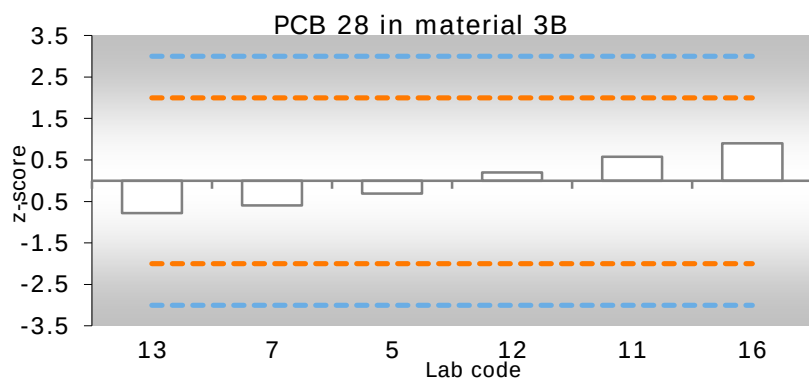
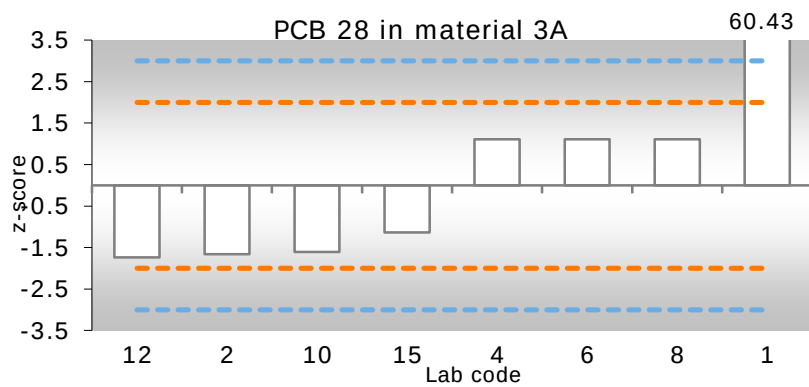
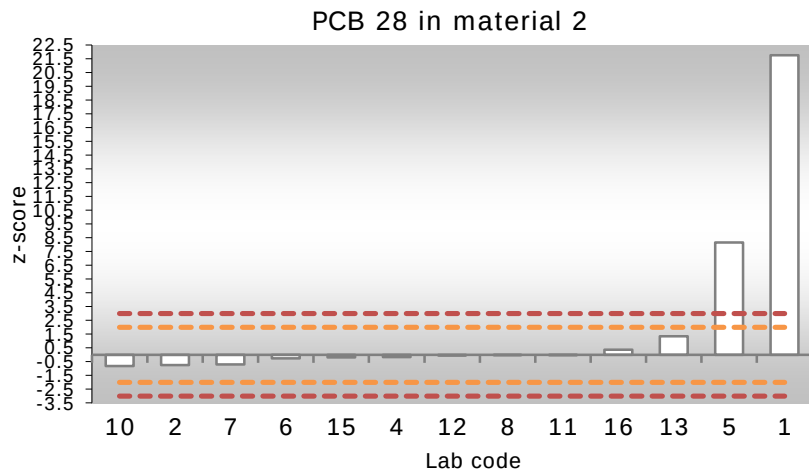
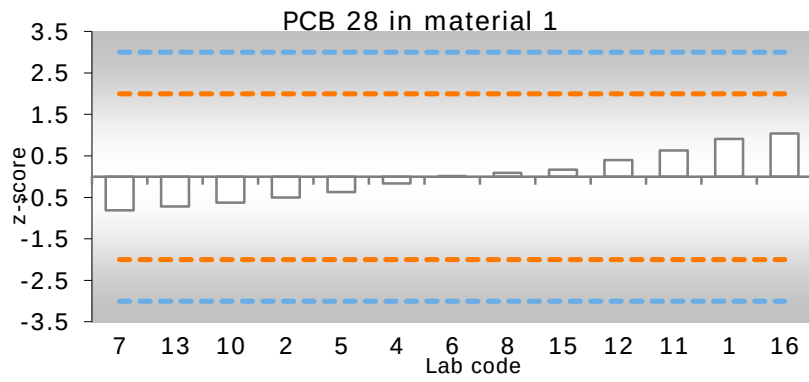
Lab code	PCB mb (material 1)		PCB mb (material 2)		PCB mb (material 3a)		PCB mb (material 3b)	
	AV: 0.79 ng / kg		AV: 0.89 ng / kg		AV: 1.96 ng / kg		AV: 1.90 ng / kg	
	Uncertainty of AV: 0.02 ng / kg		Uncertainty of AV: 0.05 ng / kg		Uncertainty of AV: 0.13 ng / kg		Uncertainty of AV: 0.09 ng / kg	
	Target sd: 0.17 ng / kg		Target sd: 0.20 ng / kg		Target sd: 0.43 ng / kg		Target sd: 0.42 ng / kg	
	Robust sd: 0.07 ng / kg		Robust sd: 0.15 ng / kg		Robust sd: 0.29 ng / kg		Robust sd: 0.17 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	0.67	-0.68	0.76	-0.68	1.44	-1.20		
2	0.809	0.13	0.946	0.26	2.06	0.24		
3	0.321	-2.69	0.3632	-2.70			0.8188	-2.59
4	0.99	1.17	1.066	0.87	2.501	1.26		
5								
6	0.769	-0.10	1.105	1.07	1.634	-0.75		
7	0.726	-0.35	0.781	-0.57			1.8	-0.24
8	0.89	0.60	0.91	0.08	2.13	0.40		
9								
10	0.827274225	0.23	0.8987316	0.02	2.13916215	0.42		
11	0.791	0.02	1.05	0.79			2.12	0.53
12	0.736	-0.29	0.804	-0.46	1.87	-0.20	1.85	-0.12
13	0.83	0.25	0.8	-0.48			2	0.24
15	0.75	-0.21	0.861	-0.17	1.88	-0.18		
16	0.828	0.24	0.953	0.30			1.95	0.12



Lab code	PCB lb (material 1)		PCB lb (material 2)		PCB lb (material 3a)		PCB lb (material 3b)	
	AV: 0.79 ng / kg		AV: 0.8864 ng / kg		AV: 1.96 ng / kg		AV: 1.90 ng / kg	
	Uncertainty of AV: 0.02 ng / kg		Uncertainty of AV: 0.0496 ng / kg		Uncertainty of AV: 0.13 ng / kg		Uncertainty of AV: 0.09 ng / kg	
	Target sd: 0.17 ng / kg		Target sd: 0.1950 ng / kg		Target sd: 0.43 ng / kg		Target sd: 0.42 ng / kg	
	Robust sd: 0.07 ng / kg		Robust sd: 0.1432 ng / kg		Robust sd: 0.29 ng / kg		Robust sd: 0.17 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	z _a -score	Result (ng / kg)
1	0.67	-0.68	0.76	-0.65	1.44	-1.20		
2	0.809	0.13	0.946	0.31	2.06	0.24		
3	0.321	-2.69	0.3481	-2.76			0.8186	-2.58
4	0.99	1.17	1.066	0.92	2.501	1.26		
5								
6	0.769	-0.10	1.075	0.97	1.634	-0.75		
7	0.726	-0.35	0.781	-0.54			1.8	-0.23
8	0.89	0.60	0.91	0.12	2.13	0.40		
9								
10	0.827274225	0.23	0.8987316	0.06	2.13916215	0.42		
11	0.791	0.02	1.02	0.69			2.09	0.45
12	0.736	-0.29	0.803	-0.43	1.87	-0.20	1.85	-0.11
13	0.83	0.25	0.77	-0.60			2	0.24
15	0.75	-0.21	0.861	-0.13	1.88	-0.18		
16	0.828	0.24	0.953	0.34			1.95	0.12

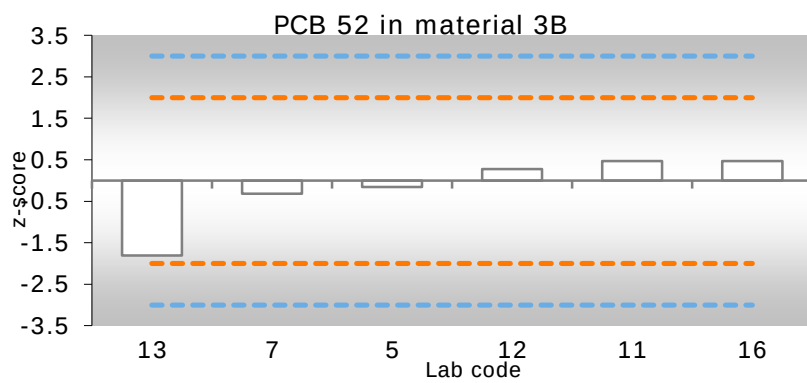
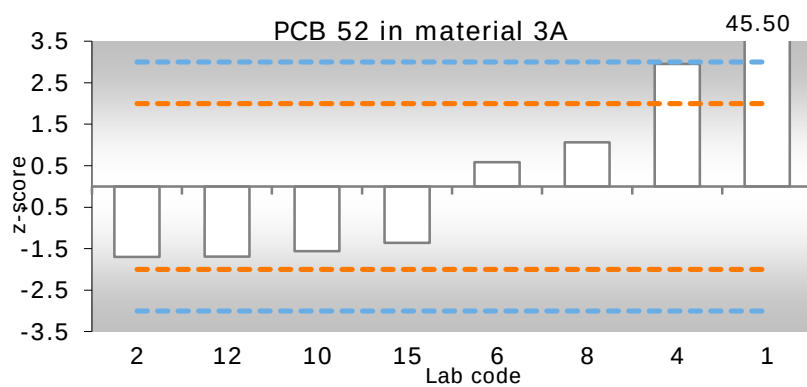
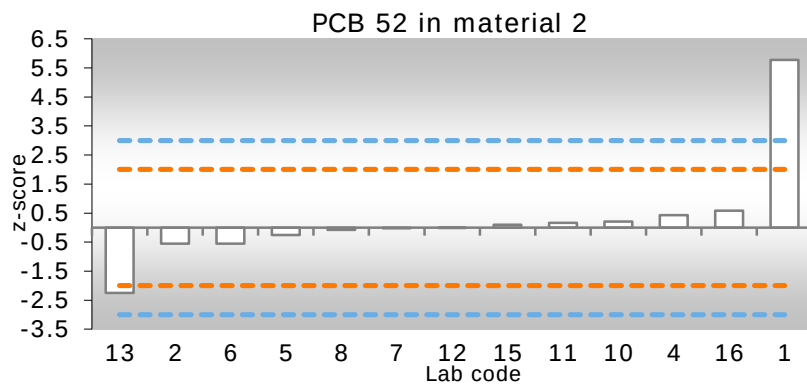
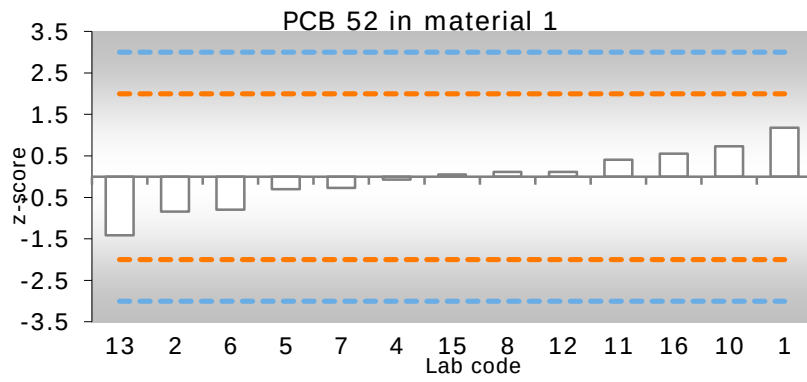


Lab code	PCB 28 (material 1)		PCB 28 (material 2)		PCB 28 (material 3a)		PCB 28 (material 3b)	
	AV: 2846 ng / kg		AV: 401 ng / kg		AV: 64.5 ng / kg		AV: 0.3715 ng / kg	
	Uncertainty of AV: 94.3 ng / kg		Uncertainty of AV: 17.3 ng / kg		Uncertainty of AV: 28.7 ng / kg		Uncertainty of AV: 0.0167 ng / kg	
	Target sd: 389 ng / kg		Target sd: 73.5 ng / kg		Target sd: 14.2 ng / kg		Target sd: 0.0817 ng / kg	
	Robust sd: 272 ng / kg		Robust sd: 49.9 ng / kg		Robust sd: 65.0 ng / kg		Robust sd: 0.0354 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score
1	3200	0.91	2000	21.75	2000	60.43		
2	2650	-0.50	345	-0.76	11.4	-1.66		
3								
4	2782.6	-0.16	388.79	-0.16	100	1.11		
5	2700	-0.38	1000	8.15			5500	-0.31
6	2850	0.01	382	-0.25	100	1.11		
7	2530	-0.81	350	-0.69			5280	-0.59
8	2880	0.09	400	-0.01	100	1.11		
9								
10	2601.435	-0.63	340.25	-0.82	13.01	-1.61		
11	3090	0.63	400	-0.01			6180	0.58
12	3000	0.40	397	-0.05	8.9	-1.74	5892	0.20
13	2567	-0.72	500	1.35			5136	-0.78
15	2910	0.16	386	-0.20	28.2	-1.13		
16	3250	1.04	428	0.37			6430	0.90

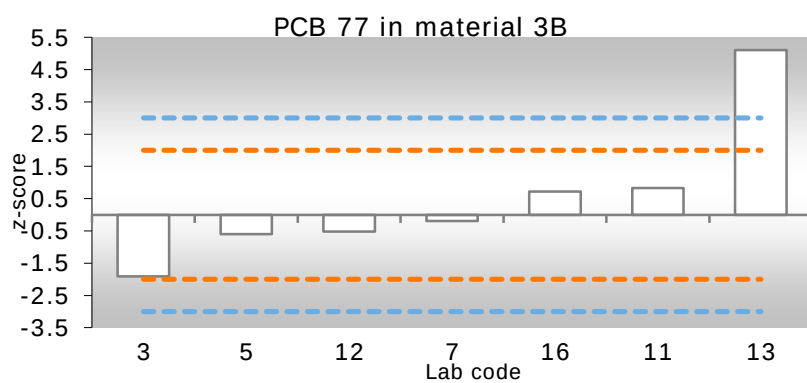
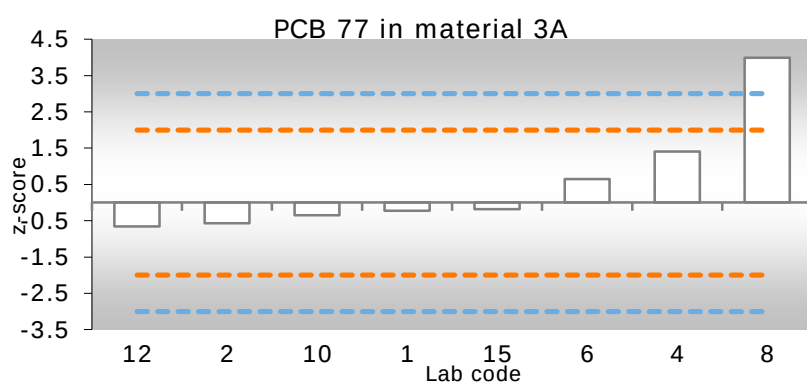
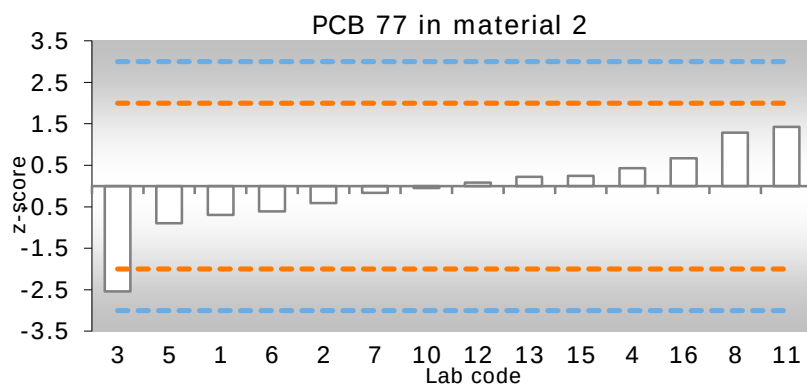
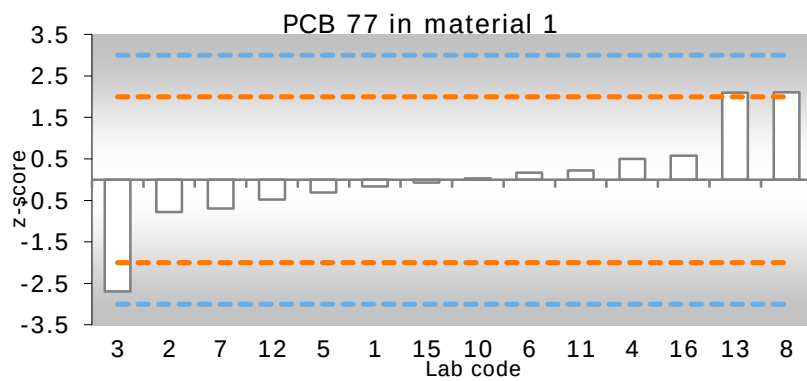


Lab code	PCB 52 (material 1)		PCB 52 (material 2)		PCB 52 (material 3a)*		PCB 52 (material 3b)	
	AV: 2403 ng / kg Uncertainty of AV: 71.4 ng / kg Target sd: 337 ng / kg Robust sd: 206 ng / kg		AV: 1043 ng / kg Uncertainty of AV: 26.1 ng / kg Target sd: 165.8 ng / kg Robust sd: 75.3 ng / kg		AV: 75.2 ng / kg Uncertainty of AV: 38.9 ng / kg Target sd: 16.5 ng / kg Robust sd: 88.1 ng / kg		AV: 4795 ng / kg Uncertainty of AV: 178 ng / kg Target sd: 606 ng / kg Robust sd: 350 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score
	1	2800	1.18	2000	5.77	2000	45.50	
	2	2120	-0.84	952	-0.55	3.48	-1.70	
3								
4	2377.8	-0.07	1114.44	0.43	200	2.95		
5	2300	-0.30	1000	-0.26			4700	-0.16
6	2135	-0.79	952	-0.55	100	0.59		
7	2310	-0.27	1040	-0.02			4600	-0.32
8	2440	0.11	1030	-0.08	120	1.06		
9								
10	2648.96	0.73	1078.525	0.21	9.29	-1.56		
11	2540	0.41	1070	0.16			5080	0.47
12	2440	0.11	1043	0.00	3.5	-1.69	4963	0.28
13	1926	-1.41	670	-2.25			3701	-1.81
15	2420	0.05	1060	0.10	17.6	-1.36		
16	2590	0.56	1140	0.58			5080	0.47

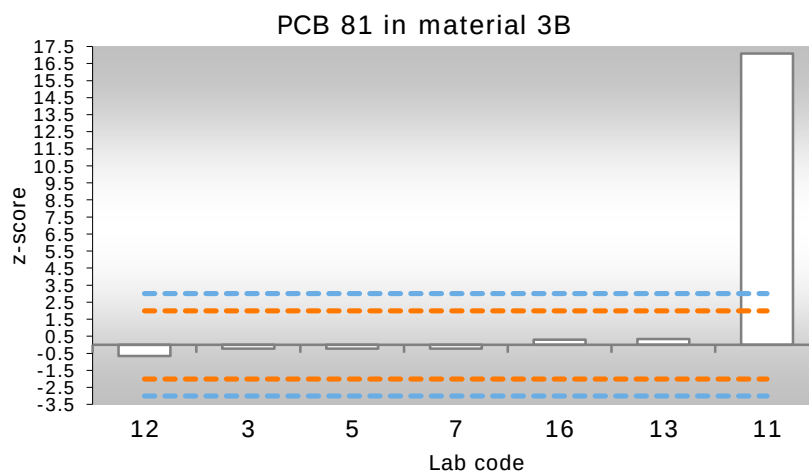
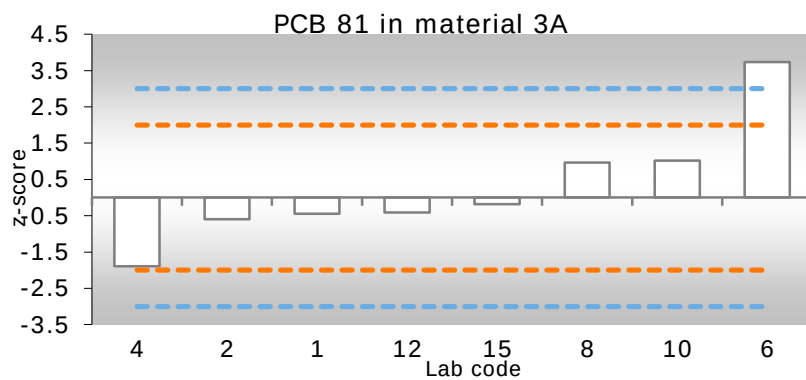
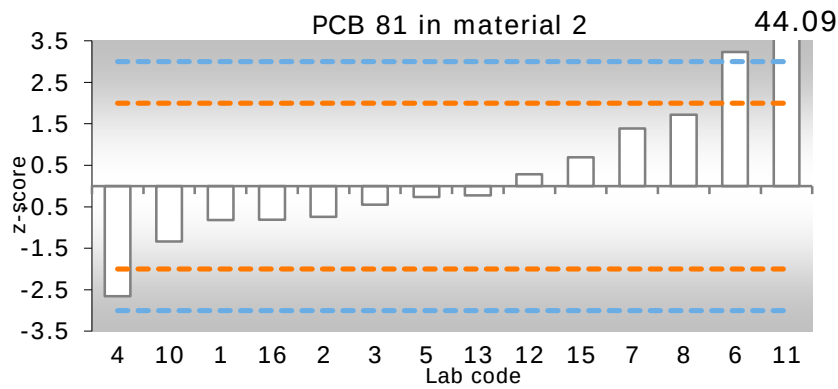
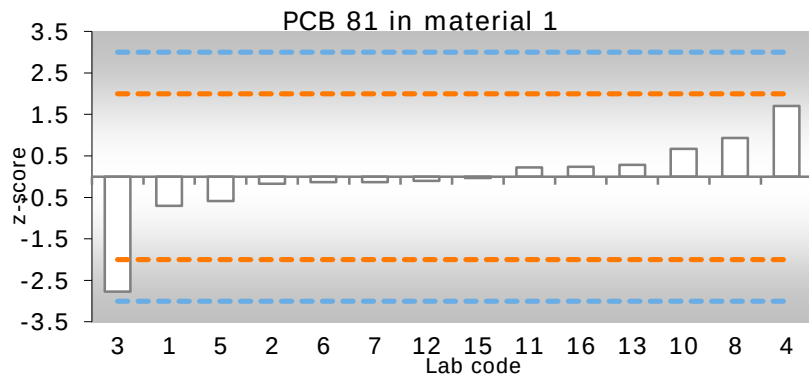
* Uncertainty of assigned value is very high, results are presented for information only.



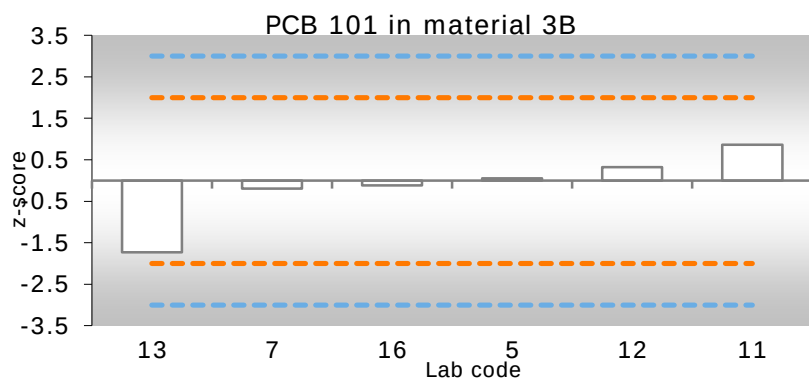
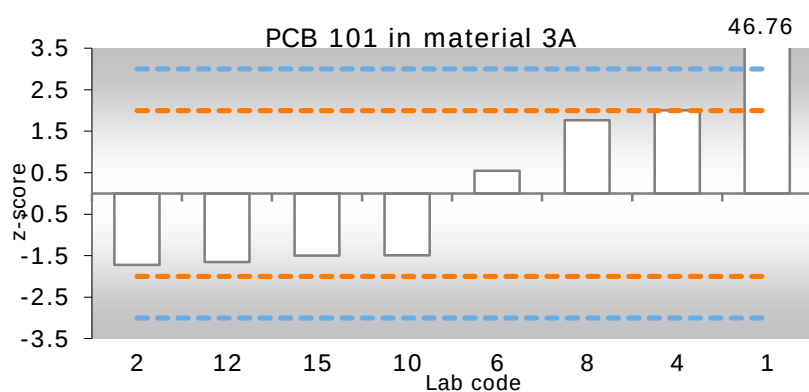
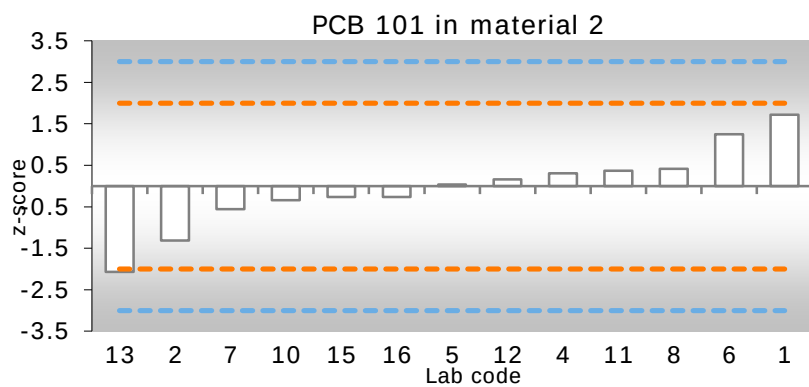
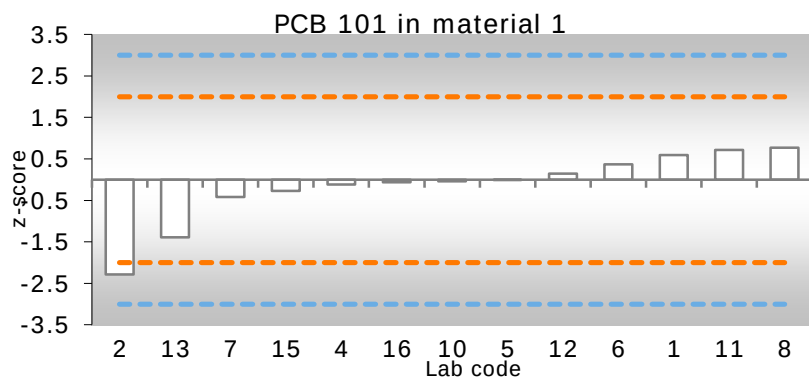
Lab code	PCB 77 (material 1)		PCB 77 (material 2)		PCB 77 (material 3a)		PCB 77 (material 3b)	
	AV: 6.85 ng / kg Uncertainty of AV: 0.37 ng / kg Target sd: 1.51 ng / kg Robust sd: 1.12 ng / kg		AV: 22.3 ng / kg Uncertainty of AV: 1.33 ng / kg Target sd: 4.91 ng / kg Robust sd: 3.97 ng / kg		AV: 4.00 ng / kg Uncertainty of AV: 0.27 ng / kg Target sd: 0.88 ng / kg Robust sd: 0.61 ng / kg		AV: 4.03 ng / kg Uncertainty of AV: 0.76 ng / kg Target sd: 0.89 ng / kg Robust sd: 1.62 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score
1	6.6	-0.16	18.9	-0.69	3.8	-0.22		
2	5.67	-0.78	20.3	-0.41	3.48	-0.57		
3	2.786	-2.70	9.853	-2.54			1.791	-1.91
4	7.6	0.50	24.41	0.43	5.3	1.41		
5	6.38	-0.31	17.9	-0.90			3.33	-0.60
6	7.1	0.17	19.3	-0.61	4.6	0.65		
7	5.8	-0.69	21.5	-0.16			3.8	-0.20
8	10.01	2.10	28.61	1.29	7.68	3.99		
9								
10	6.895	0.03	22.06	-0.05	3.685	-0.35		
11	7.18	0.22	29.3	1.43			5	0.83
12	6.12	-0.48	22.69	0.08	3.4	-0.66	3.42	-0.52
13	10	2.09	23.38	0.22			10	5.10
15	6.74	-0.07	23.5	0.24	3.84	-0.18		
16	7.72	0.58	25.6	0.67			4.87	0.72



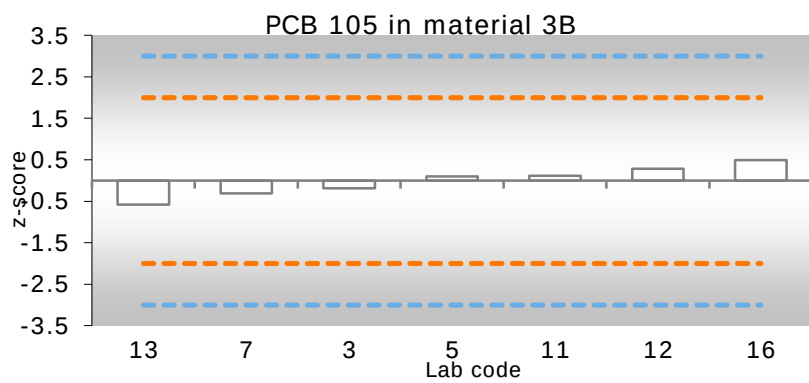
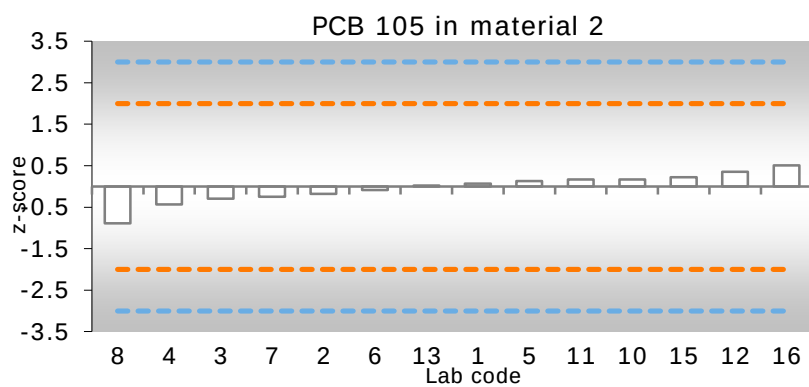
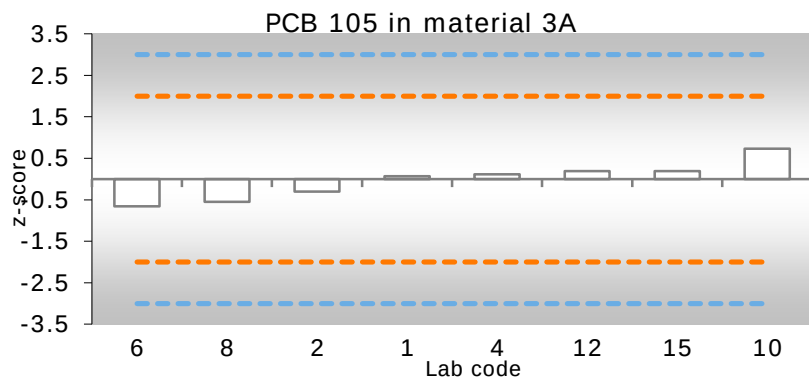
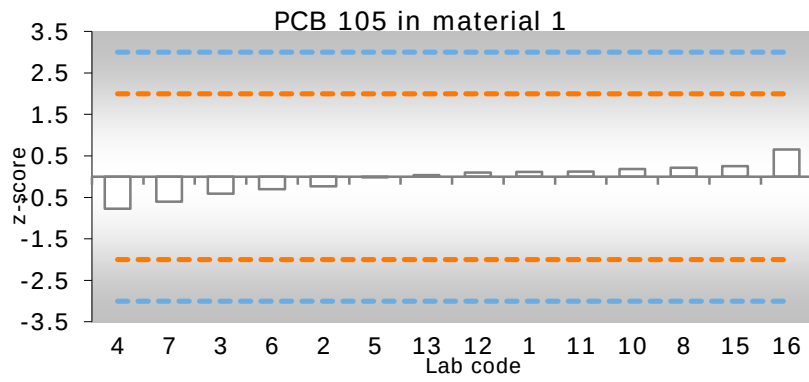
Lab code	PCB 81 (material 1)		PCB 81 (material 2)		PCB 81 (material 3a)		PCB 81 (material 3b)	
	AV: 5.56 ng / kg		AV: 1.12 ng / kg		AV: 1.02 ng / kg		AV: 1.05 ng / kg	
	Uncertainty of AV: 0.22 ng / kg		Uncertainty of AV: 0.11 ng / kg		Uncertainty of AV: 0.14 ng / kg		Uncertainty of AV: 0.057 ng / kg	
	Target sd: 1.22 ng / kg		Target sd: 0.25 ng / kg		Target sd: 0.22 ng / kg		Target sd: 0.23 ng / kg	
	Robust sd: 0.66 ng / kg		Robust sd: 0.34 ng / kg		Robust sd: 0.31 ng / kg		Robust sd: 0.12 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score
1	4.7	-0.70	0.9	-0.82	0.9	-0.44		
2	5.35	-0.17	0.92	-0.74	0.86	-0.60		
3	2.175	-2.77	1	-0.45			1	-0.22
4	7.65	1.71	0.4	-2.66	0.52	-1.89		
5	4.84	-0.59	1.05	-0.27			1	-0.22
6	5.4	-0.13	2	3.23	2	3.74		
7	5.4	-0.13	1.5	1.39			1	-0.22
8	6.7	0.93	1.59	1.72	1.27	0.96		
9								
10	6.38	0.67	0.76	-1.33	1.285	1.02		
11	5.83	0.22	13.1	44.09			5	17.09
12	5.44	-0.10	1.2	0.29	0.91	-0.41	0.901	-0.65
13	5.91	0.28	1.06	-0.23			1.13	0.34
15	5.52	-0.03	1.31	0.69	0.97	-0.18		
16	5.85	0.23	0.902	-0.81			1.1	0.30



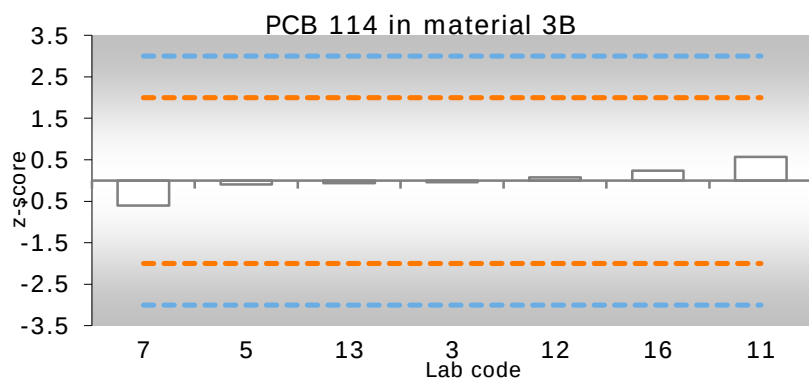
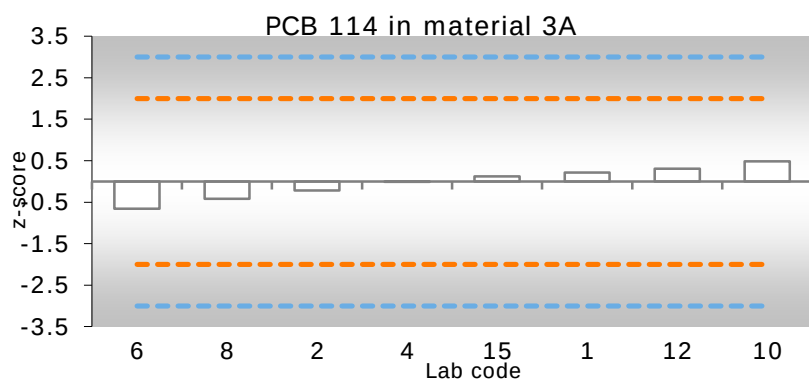
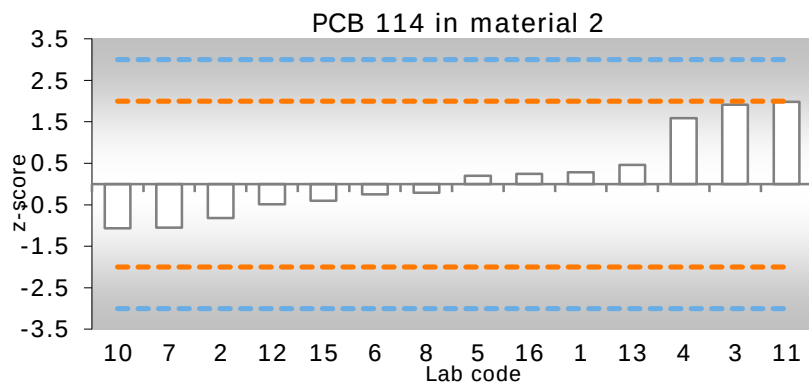
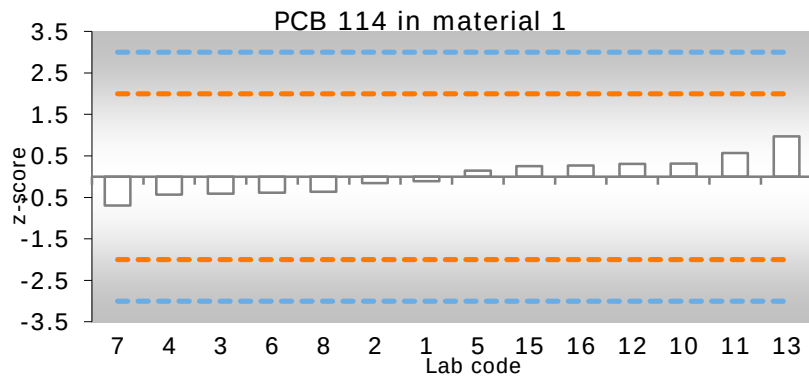
Lab code	PCB 101 (material 1)		PCB 101 (material 2)		PCB 101 (material 3a)		PCB 101 (material 3b)	
	AV: 2400 ng / kg Uncertainty of AV: 70.6 ng / kg Target sd: 337 ng / kg Robust sd: 204 ng / kg		AV: 1592 ng / kg Uncertainty of AV: 51.9 ng / kg Target sd: 237 ng / kg Robust sd: 150 ng / kg		AV: 77.5 ng / kg Uncertainty of AV: 37.4 ng / kg Target sd: 17.1 ng / kg Robust sd: 84.6 ng / kg		AV: 4769 ng / kg Uncertainty of AV: 138 ng / kg Target sd: 603 ng / kg Robust sd: 270 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score
	1	2600	0.59	2000	1.72	2000	46.76	
	2	1630	-2.29	1280	-1.31	6.58	-1.73	
3								
4	2360.6	-0.12	1663.88	0.30	160	2.01		
5	2400	0.00	1600	0.03			4800	0.05
6	2524	0.37	1888	1.25	100	0.55		
7	2260	-0.42	1460	-0.56			4650	-0.20
8	2660	0.77	1690	0.41	150	1.76		
9								
10	2387.605	-0.04	1510.435	-0.34	16.11	-1.49		
11	2640	0.71	1680	0.37			5290	0.86
12	2450	0.15	1630	0.16	9.5	-1.65	4965	0.32
13	1931	-1.39	1101	-2.07			3724	-1.73
15	2310	-0.27	1530	-0.26	15.8	-1.50		
16	2380	-0.06	1530	-0.26			4700	-0.11



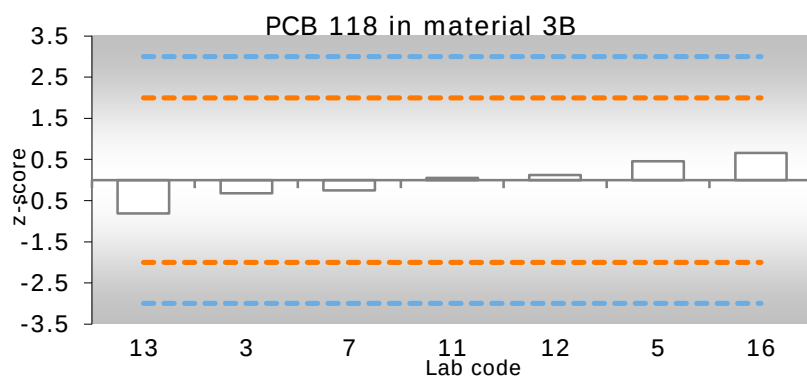
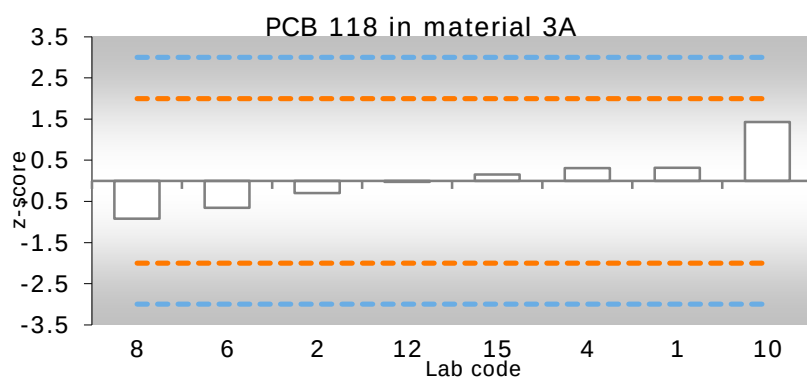
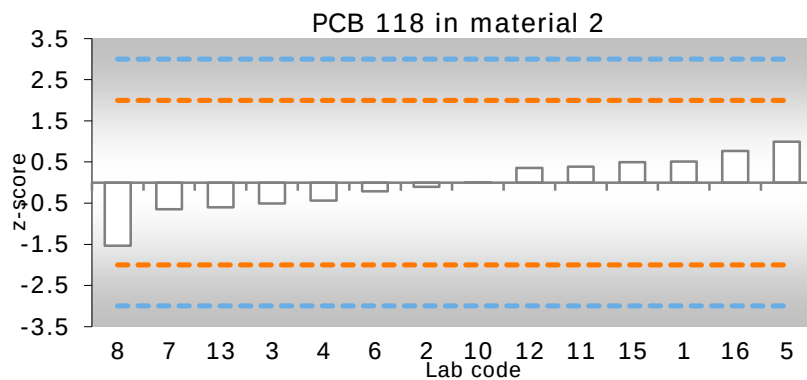
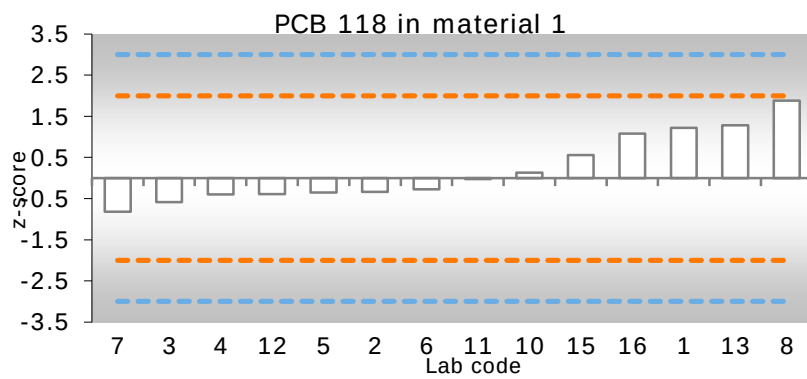
Lab code	PCB 105 (material 1)		PCB 105 (material 2)		PCB 105 (material 3a)		PCB 105 (material 3b)	
	AV: 76.1 ng / kg Uncertainty of AV: 1.54 ng / kg Target sd: 16.7 ng / kg Robust sd: 4.62 ng / kg		AV: 388 ng / kg Uncertainty of AV: 7.43 ng / kg Target sd: 71.6 ng / kg Robust sd: 22.2 ng / kg		AV: 109 ng / kg Uncertainty of AV: 4.42 ng / kg Target sd: 24.1 ng / kg Robust sd: 10.0 ng / kg		AV: 107 ng / kg Uncertainty of AV: 138 ng / kg Target sd: 603 ng / kg Robust sd: 270 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	78	0.11	393	0.07	111	0.07		
2	72.2	-0.23	375	-0.18	102	-0.30		
3	69.3	-0.41	367	-0.29			103	-0.19
4	63.16	-0.77	357.03	-0.43	112.09	0.11		
5	75.9	-0.01	397.4	0.13			109.7	0.10
6	71	-0.31	381.9	-0.08	93.6	-0.65		
7	66	-0.60	370	-0.25			100	-0.31
8	79.77	0.22	324.3	-0.89	96.18	-0.55		
9								
10	79.2	0.18	400.2	0.17	126.95	0.73		
11	78.2	0.12	400	0.17			110	0.11
12	77.8	0.10	413	0.35	114	0.19	114	0.28
13	76.71	0.03	389.19	0.02			93.75	-0.58
15	80.4	0.26	404	0.22	114	0.19		
16	87.1	0.66	424	0.50			119	0.49



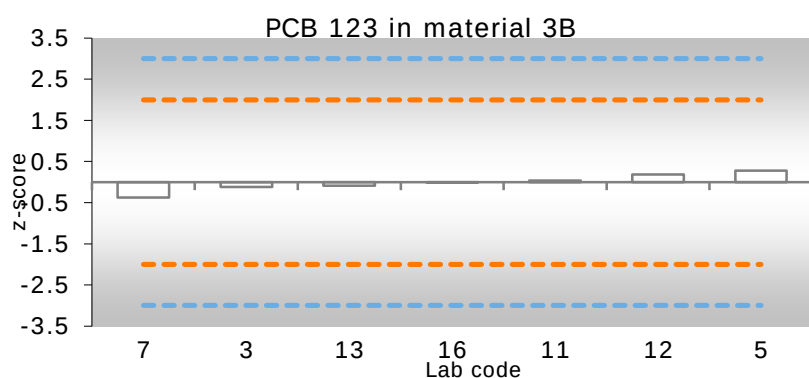
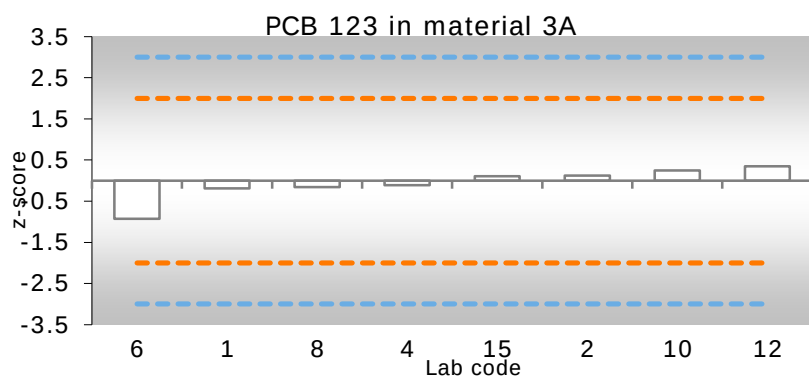
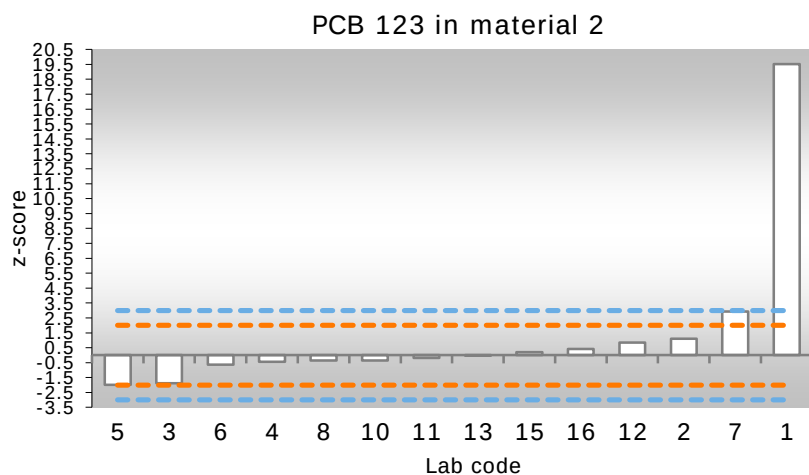
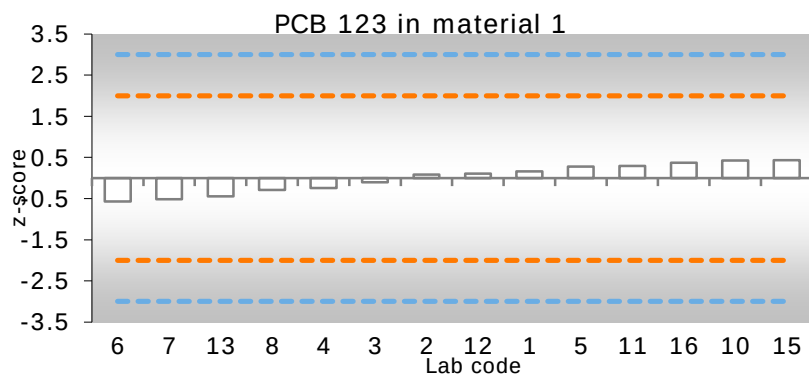
Lab code	PCB 114 (material 1)		PCB 114 (material 2)		PCB 114 (material 3a)		PCB 114 (material 3b)	
	AV: 77.2 ng / kg Uncertainty of AV: 2.79 ng / kg Target sd: 17.1 ng / kg Robust sd: 8.34 ng / kg		AV: 27.3 ng / kg Uncertainty of AV: 1.65 ng / kg Target sd: 6.01 ng / kg Robust sd: 4.95 ng / kg		AV: 92.7 ng / kg Uncertainty of AV: 3.67 ng / kg Target sd: 20.4 ng / kg Robust sd: 8.31 ng / kg		AV: 96.9 ng / kg Uncertainty of AV: 2.03 ng / kg Target sd: 21.3 ng / kg Robust sd: 4.31 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
	1	76	-0.11	29	0.28	97	0.21	
	2	75.2	-0.16	22.4	-0.82	88.2	-0.22	
3	70.9	-0.41	38.8	1.91			96	-0.04
4	70.39	-0.44	36.87	1.59	92.54	-0.01		
5	80.3	0.14	28.5	0.20			94.9	-0.09
6	71.2	-0.39	25.8	-0.25	79.2	-0.66		
7	66	-0.69	21	-1.05			84	-0.60
8	71.64	-0.36	26.07	-0.21	84.18	-0.42		
9								
10	83.32	0.32	20.91	-1.07	102.6	0.49		
11	87.6	0.57	39.2	1.98			109	0.57
12	83.1	0.30	24.4	-0.49	99	0.31	98.5	0.08
13	94.56	0.97	30.07	0.46			95.57	-0.06
15	82.2	0.25	24.9	-0.40	95.2	0.12		
16	82.5	0.27	28.8	0.25			102	0.24



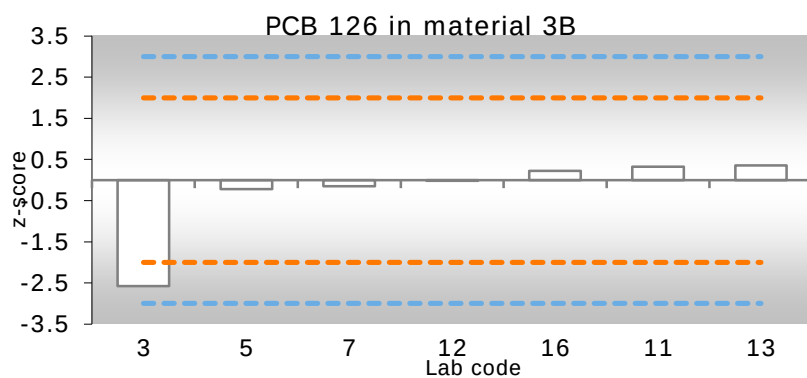
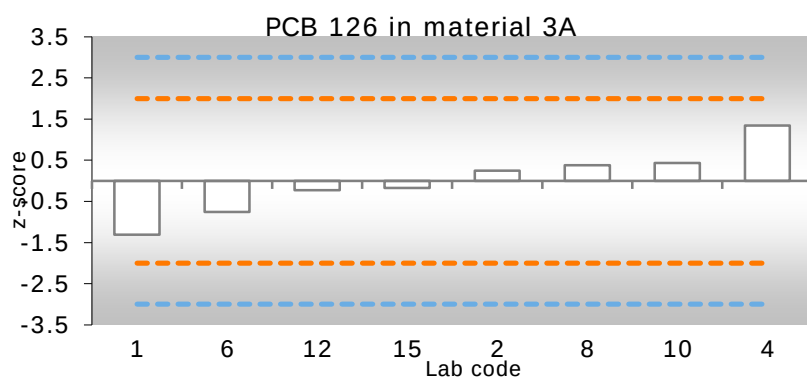
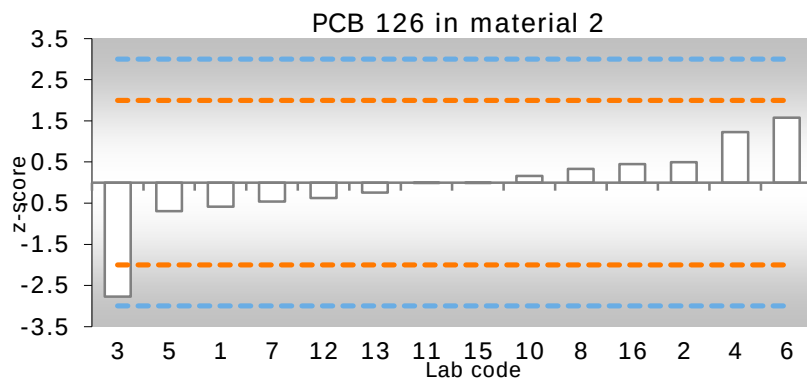
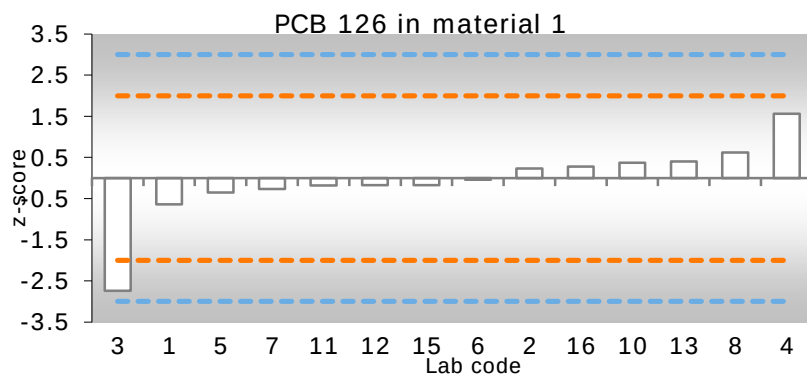
Lab code	PCB 118 (material 1)		PCB 118 (material 2)		PCB 118 (material 3a)		PCB 118 (material 3b)	
	AV: 78.1 ng / kg Uncertainty of AV: 3.43 ng / kg Target sd: 17.2 ng / kg Robust sd: 10.3 ng / kg		AV: 1179 ng / kg Uncertainty of AV: 42.2 ng / kg Target sd: 184 ng / kg Robust sd: 126 ng / kg		AV: 217 ng / kg Uncertainty of AV: 10.3ng / kg Target sd: 43.7 ng / kg Robust sd: 23.4 ng / kg		AV: 213 ng / kg Uncertainty of AV: 11.2 ng / kg Target sd: 43.0 ng / kg Robust sd: 23.7 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
	1	99	1.22	1273	0.51	231	0.32	
	2	72.3	-0.34	1160	-0.10	204	-0.30	
3	68	-0.59	1086	-0.51			199	-0.32
4	71.21	-0.40	1098.67	-0.44	230.6	0.31		
5	72	-0.35	1361.9	0.99			232.5	0.46
6	73.4	-0.27	1140.3	-0.21	188.6	-0.65		
7	64	-0.82	1060	-0.65			202	-0.25
8	110.34	1.88	897.15	-1.53	177.1	-0.92		
9								
10	80.36	0.13	1179.44	0.00	279.58	1.43		
11	77.6	-0.03	1250	0.38			215	0.05
12	71.4	-0.39	1245	0.36	216	-0.03	218	0.12
13	100	1.28	1069	-0.60			177.91	-0.81
15	87.6	0.56	1270	0.49	224	0.16		
16	96.6	1.08	1320	0.76			241	0.66



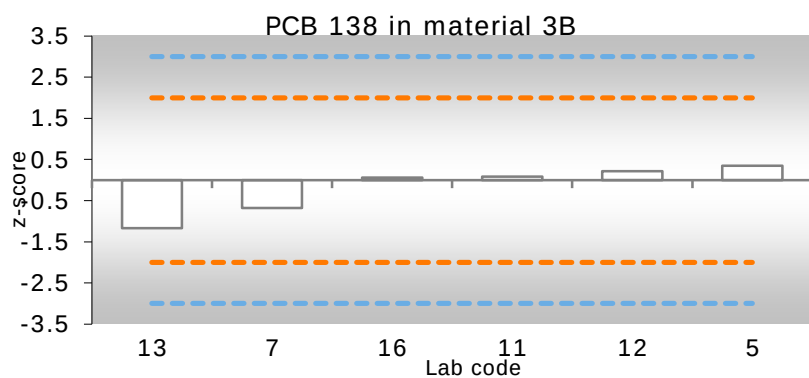
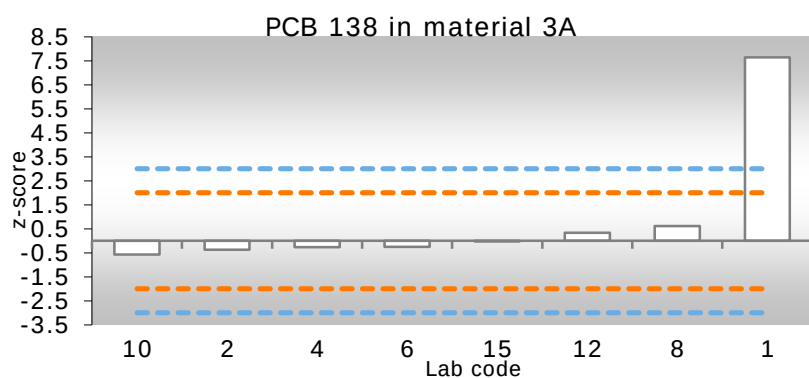
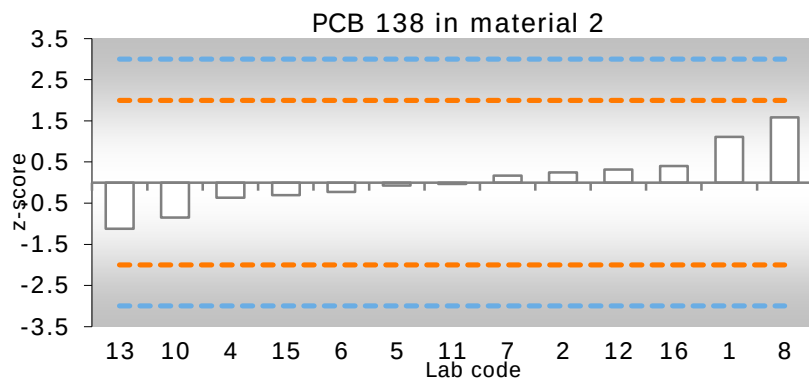
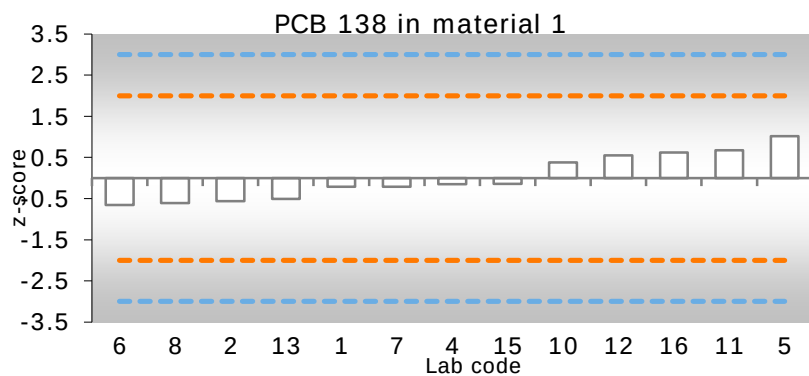
Lab code	PCB 123 (material 1)		PCB 123 (material 2)		PCB 123 (material 3a)		PCB 123 (material 3b)	
	AV: 74.4 ng / kg		AV: 16.7 ng / kg		AV: 89.7 ng / kg		AV: 92.6 ng / kg	
	Uncertainty of AV: 2.23 ng / kg		Uncertainty of AV: 1.15 ng / kg		Uncertainty of AV: 2.45 ng / kg		Uncertainty of AV: 1.87 ng / kg	
	Target sd: 16.4 ng / kg		Target sd: 3.68 ng / kg		Target sd: 19.7 ng / kg		Target sd: 20.4 ng / kg	
	Robust sd: 6.68 ng / kg		Robust sd: 3.43 ng / kg		Robust sd: 5.54 ng / kg		Robust sd: 3.96 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	77	0.16	92	19.52	86	-0.19		
2	75.8	0.09	21	1.11	92	0.12		
3	72.7	-0.10	9.5	-1.88			90.2	-0.12
4	70.45	-0.24	15.07	-0.43	87.4	-0.11		
5	78.9	0.28	9.1	-1.98			98.3	0.28
6	65.1	-0.57	14.3	-0.63	71.3	-0.93		
7	66	-0.51	28	2.92			85	-0.37
8	69.61	-0.29	15.33	-0.36	86.47	-0.16		
9								
10	81.335	0.42	15.39	-0.35	94.48	0.24		
11	79.2	0.29	16	-0.19			93.4	0.04
12	76.1	0.10	20	0.85	96.5	0.35	96.4	0.19
13	67.13	-0.44	16.6	-0.03			90.84	-0.09
15	81.5	0.43	17.5	0.20	91.8	0.11		
16	80.5	0.37	18.3	0.41			92.5	-0.01



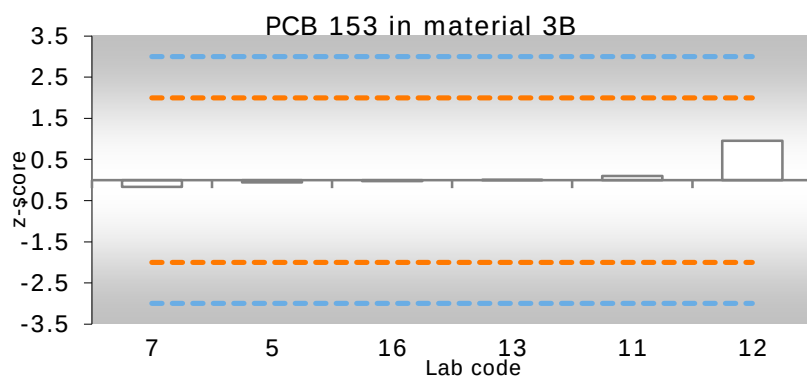
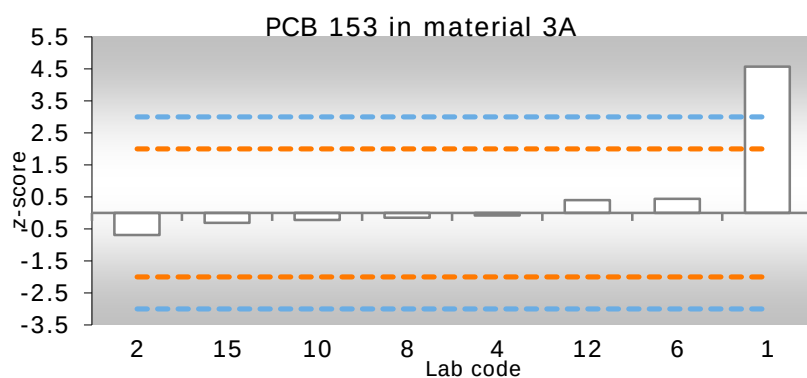
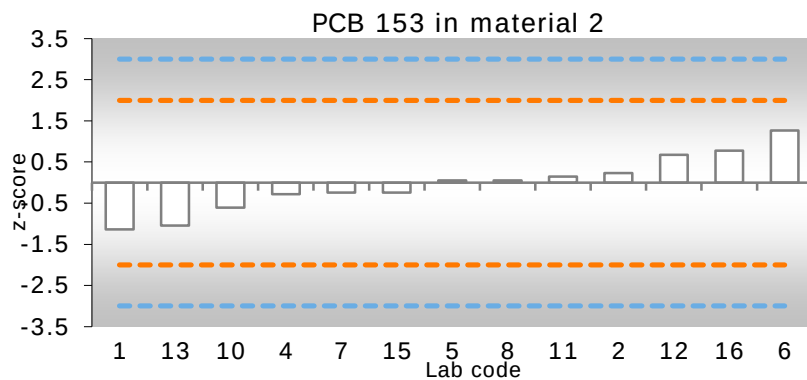
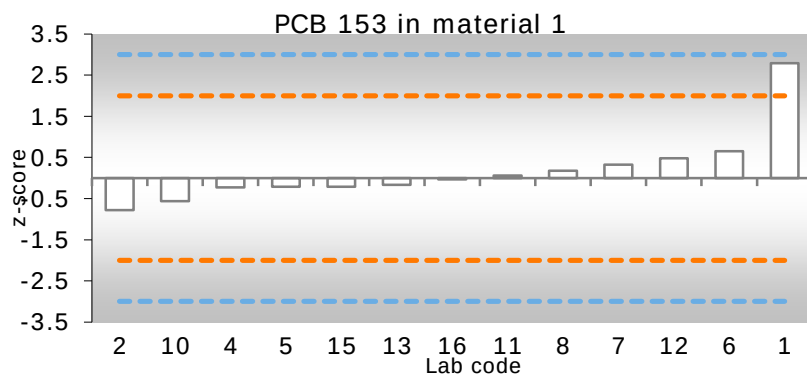
Lab code	PCB 126 (material 1)		PCB 126 (material 2)		PCB 126 (material 3a)		PCB 126 (material 3b)	
	AV: 6.06 ng / kg		AV: 7.57 ng / kg		AV: 18.1 ng / kg		AV: 17.1 ng / kg	
	Uncertainty of AV: 0.22 ng / kg		Uncertainty of AV: 0.38 ng / kg		Uncertainty of AV: 1.15 ng / kg		Uncertainty of AV: 0.67 ng / kg	
	Target sd: 1.33 ng / kg		Target sd: 1.67 ng / kg		Target sd: 3.98 ng / kg		Target sd: 3.76 ng / kg	
	Robust sd: 0.67 ng / kg		Robust sd: 1.15 ng / kg		Robust sd: 2.59 ng / kg		Robust sd: 1.41 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	5.2	-0.64	6.6	-0.58	12.9	-1.31		
2	6.36	0.23	8.4	0.50	19.1	0.25		
3	2.402	-2.74	2.959	-2.77			7.381	-2.58
4	8.14	1.56	9.61	1.23	23.47	1.35		
5	5.59	-0.35	6.41	-0.70			16.23	-0.22
6	6	-0.04	10.2	1.58	15.1	-0.75		
7	5.7	-0.27	6.8	-0.46			16.5	-0.15
8	6.88	0.62	8.12	0.33	19.6	0.38		
9								
10	6.545	0.37	7.835	0.16	19.835	0.43		
11	5.81	-0.18	7.55	-0.01			18.3	0.33
12	5.82	-0.18	6.95	-0.37	17.2	-0.23	17	-0.02
13	6.59	0.40	7.16	-0.25			18.4	0.35
15	5.82	-0.18	7.55	-0.01	17.4	-0.18		
16	6.43	0.28	8.32	0.45			17.9	0.22



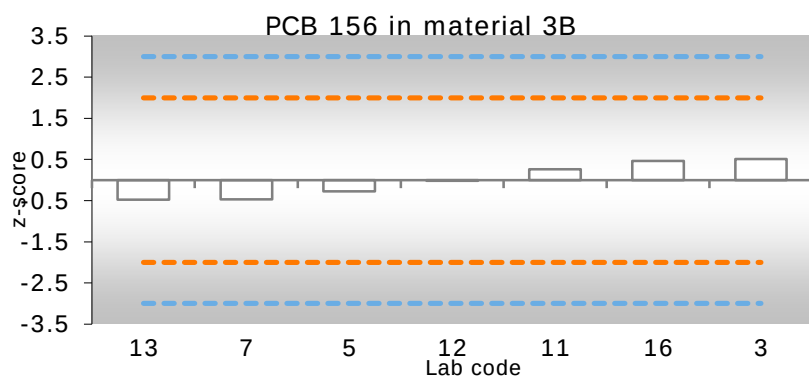
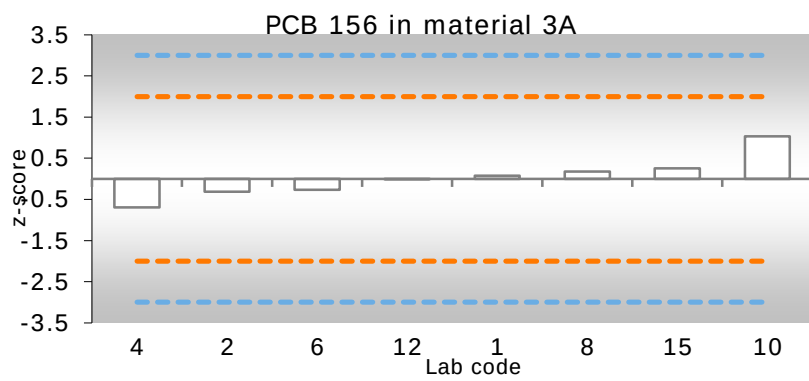
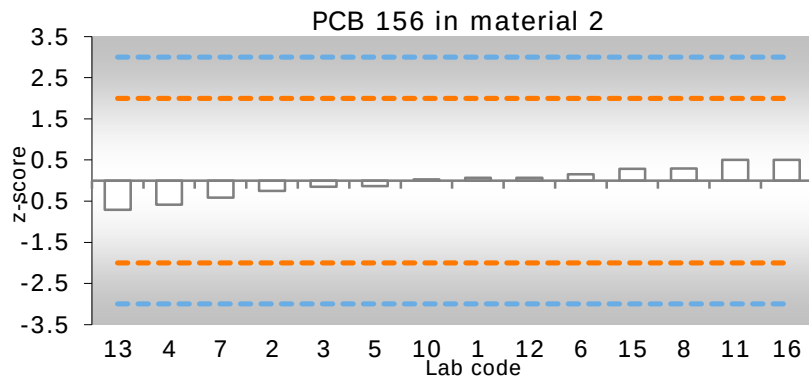
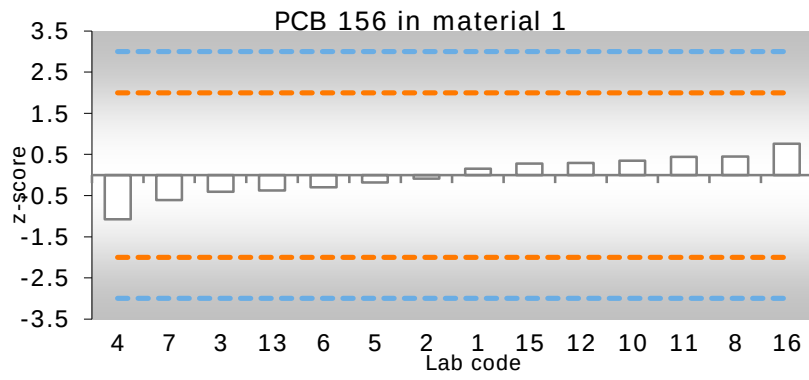
Lab code	PCB 138 (material 1)		PCB 138 (material 2)		PCB 138 (material 3a)		PCB 138 (material 3b)	
	AV: 2987 ng / kg Uncertainty of AV: 87.3 ng / kg Target sd: 405 ng / kg Robust sd: 252 ng / kg		AV: 1718 ng / kg Uncertainty of AV: 48.0 ng / kg Target sd: 253 ng / kg Robust sd: 138 ng / kg		AV: 891 ng / kg Uncertainty of AV: 33.2 ng / kg Target sd: 145 ng / kg Robust sd: 75.1 ng / kg		AV: 7397 ng / kg Uncertainty of AV: 154 ng / kg Target sd: 876 ng / kg Robust sd: 302 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
	1	2900	-0.22	2000	1.11	2000	7.65	
	2	2760	-0.56	1780	0.24	836	-0.38	
3								
4	2926.6	-0.15	1624.89	-0.37	853.13	-0.26		
5	3400	1.02	1700	-0.07			7700	0.35
6	2720	-0.66	1661	-0.22	854	-0.25		
7	2900	-0.22	1760	0.17			6800	-0.68
8	2740	-0.61	2120	1.59	980	0.62		
9								
10	3140.04	0.38	1502.375	-0.85	807.005	-0.58		
11	3260	0.67	1710	-0.03			7470	0.08
12	3210	0.55	1798	0.32	940	0.34	7588	0.22
13	2782	-0.51	1434	-1.12			6370	-1.17
15	2930	-0.14	1640	-0.31	888	-0.02		
16	3240	0.62	1820	0.40			7450	0.06



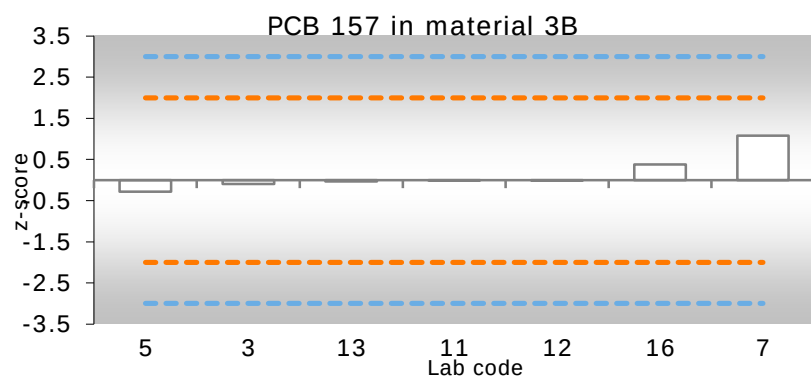
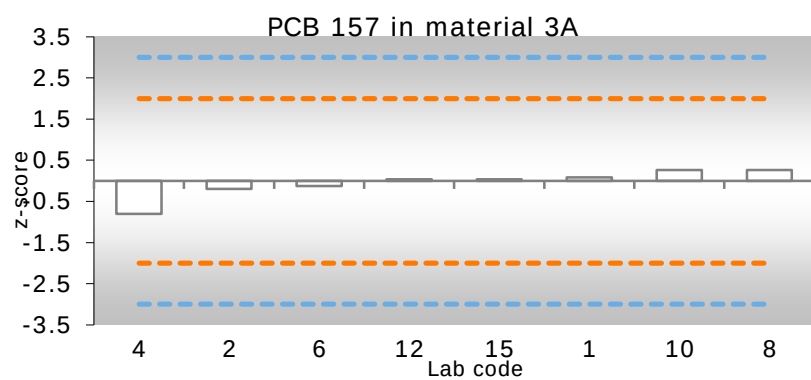
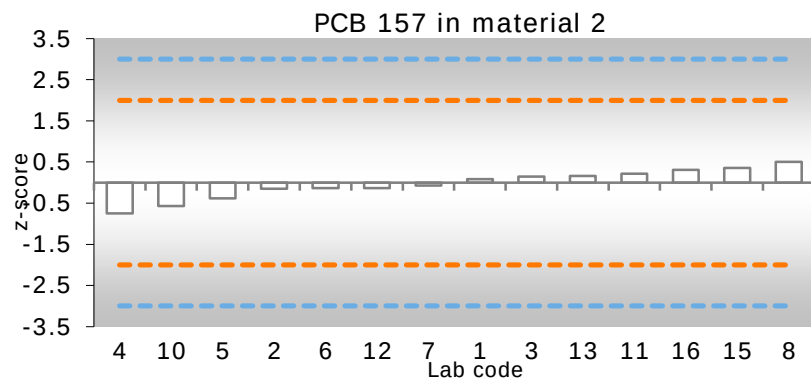
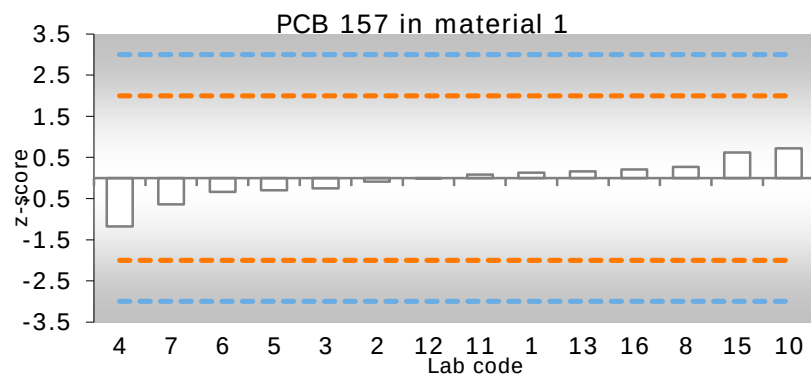
Lab code	PCB 153 (material 1)		PCB 153 (material 2)		PCB 153 (material 3a)		PCB 153 (material 3b)	
	AV: 2371 ng / kg Uncertainty of AV: 43.8 ng / kg Target sd: 333 ng / kg Robust sd: 126 ng / kg		AV: 2382 ng / kg Uncertainty of AV: 69.2 ng / kg Target sd: 334 ng / kg Robust sd: 200 ng / kg		AV: 1167 ng / kg Uncertainty of AV: 42.1 ng / kg Target sd: 182 ng / kg Robust sd: 95.2 ng / kg		AV: 5840 ng / kg Uncertainty of AV: 48.0 ng / kg Target sd: 716 ng / kg Robust sd: 94.1 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	3300	2.79	2000	-1.14	2000	4.57		
2	2110	-0.78	2460	0.23	1040	-0.70		
3								
4	2294.6	-0.23	2286.19	-0.29	1151.99	-0.08		
5	2300	-0.21	2400	0.06			5800	-0.06
6	2588	0.65	2806	1.27	1247	0.44		
7	2480	0.33	2300	-0.24			5720	-0.17
8	2430	0.18	2400	0.06	1140	-0.15		
9								
10	2184.69	-0.56	2179.065	-0.61	1126.195	-0.22		
11	2390	0.06	2430	0.14			5910	0.10
12	2530	0.48	2608	0.68	1240	0.40	6523	0.95
13	2315	-0.17	2033	-1.04			5846	0.01
15	2300	-0.21	2300	-0.24	1110	-0.31		
16	2360	-0.03	2640	0.77			5820	-0.03



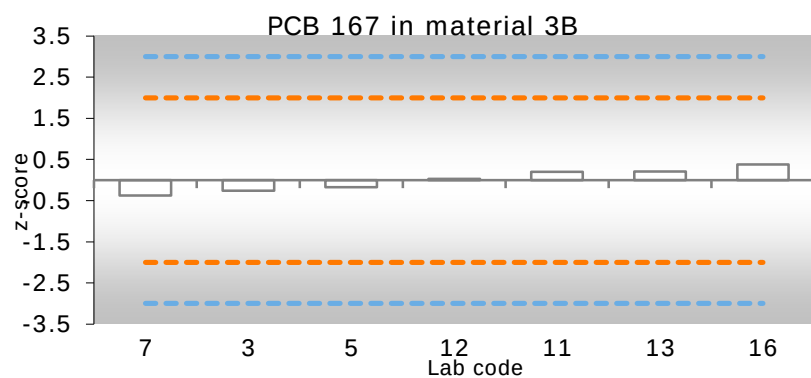
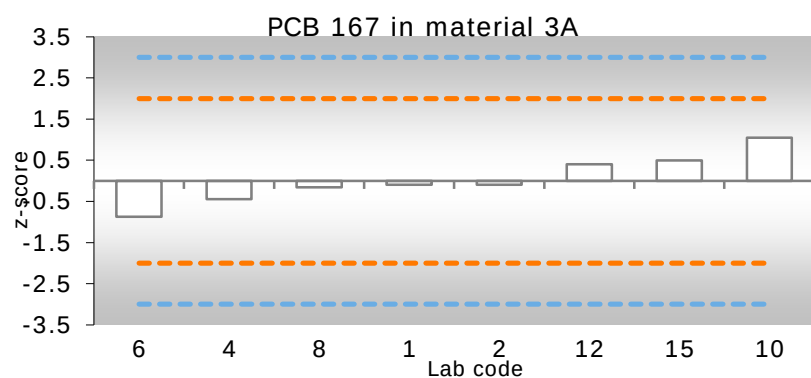
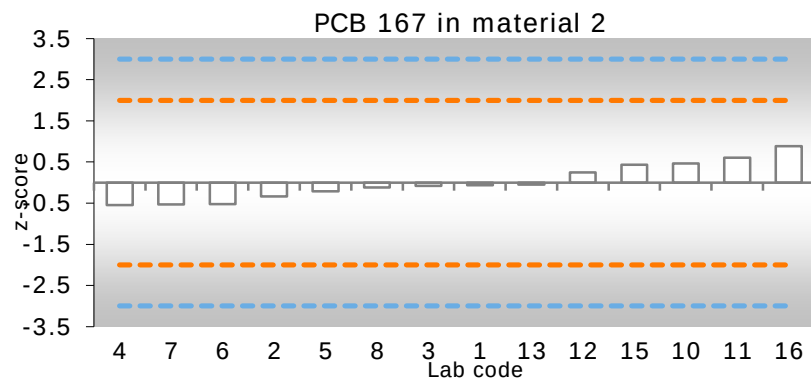
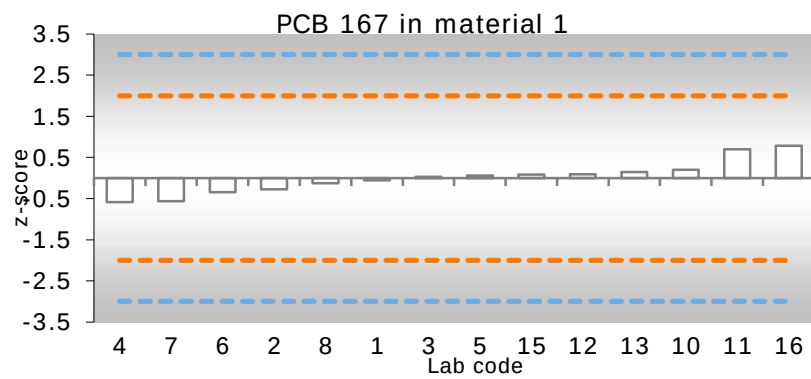
Lab code	PCB 156 (material 1)		PCB 156 (material 2)		PCB 156 (material 3a)		PCB 156 (material 3b)	
	AV: 77.4 ng / kg Uncertainty of AV: 2.95 ng / kg Target sd: 17.0 ng / kg Robust sd: 8.84 ng / kg		AV: 103 ng / kg Uncertainty of AV: 2.91 ng / kg Target sd: 22.8 ng / kg Robust sd: 8.72 ng / kg		AV: 187 ng / kg Uncertainty of AV: 6.95 ng / kg Target sd: 38.5 ng / kg Robust sd: 15.7 ng / kg		AV: 195 ng / kg Uncertainty of AV: 9.29 ng / kg Target sd: 39.8 ng / kg Robust sd: 19.7 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
	1	80	0.15	105	0.07	190	0.08	
	2	76	-0.08	97.8	-0.25	175	-0.31	
3	70.5	-0.41	100	-0.15			215	0.51
4	59.09	-1.08	90.23	-0.58	160.38	-0.69		
5	74.3	-0.18	100.5	-0.13			183.5	-0.28
6	72.4	-0.30	106.9	0.15	176.8	-0.27		
7	67	-0.61	94	-0.42			176	-0.47
8	85.1	0.45	110.22	0.30	193.96	0.18		
9								
10	83.39	0.35	104.115	0.03	226.855	1.03		
11	84.9	0.44	115	0.51			205	0.26
12	82.5	0.30	105	0.07	187	0.00	194	-0.01
13	70.99	-0.38	87.38	-0.71			175.56	-0.48
15	82.2	0.28	110	0.29	197	0.26		
16	90.4	0.76	115	0.51			213	0.46



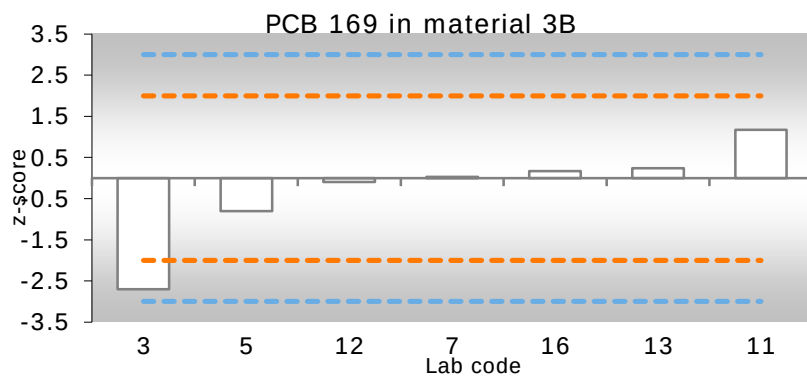
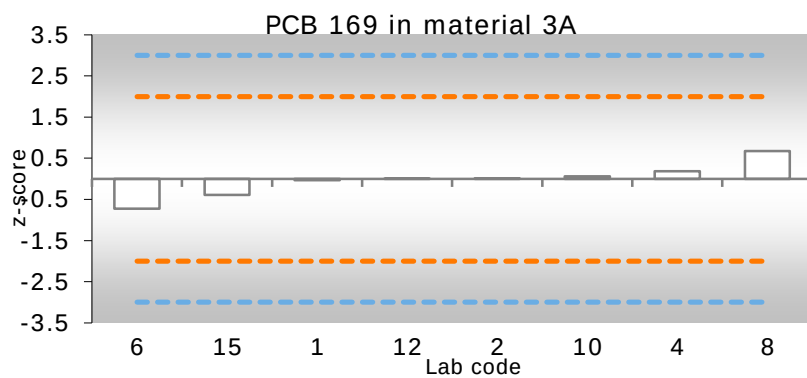
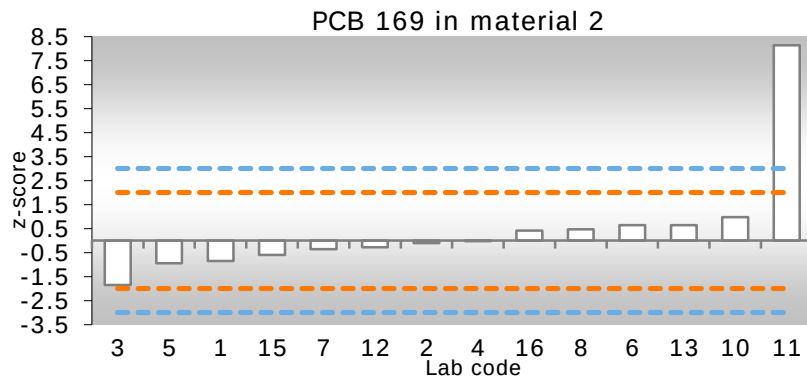
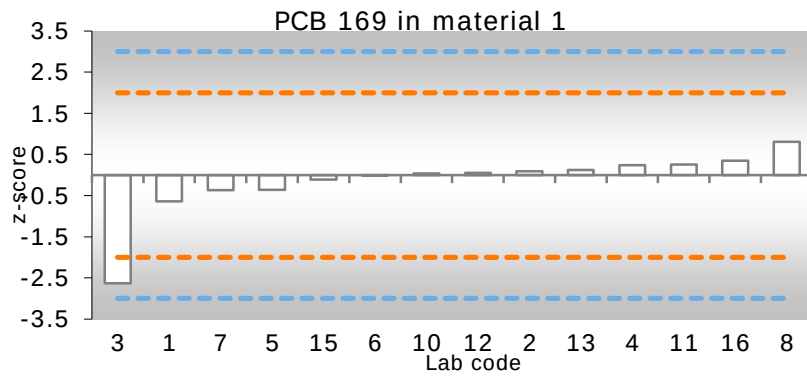
Lab code	PCB 157 (material 1)		PCB 157 (material 2)		PCB 157 (material 3a)		PCB 157 (material 3b)	
	AV: 71.0 ng / kg Uncertainty of AV: 2.16 ng / kg Target sd: 15.6 ng / kg Robust sd: 6.48 ng / kg		AV: 29.5 ng / kg Uncertainty of AV: 0.69 ng / kg Target sd: 6.49 ng / kg Robust sd: 2.08 ng / kg		AV: 104 ng / kg Uncertainty of AV: 2.54 ng / kg Target sd: 22.9 ng / kg Robust sd: 5.74 ng / kg		AV: 104 ng / kg Uncertainty of AV: 1.67 ng / kg Target sd: 22.9 ng / kg Robust sd: 3.53 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
	1	73	0.13	30	0.08	106	0.08	
	2	69.7	-0.08	28.5	-0.15	99.7	-0.19	
3	67.1	-0.25	30.4	0.14			102	-0.10
4	52.6	-1.18	24.63	-0.75	85.83	-0.80		
5	66.4	-0.30	27	-0.38			97.7	-0.28
6	65.7	-0.34	28.6	-0.14	101.2	-0.13		
7	61	-0.64	29	-0.07			129	1.08
8	75.24	0.27	32.73	0.50	110.13	0.26		
9								
10	82.33	0.72	25.79	-0.57	110.12	0.26		
11	72.3	0.08	30.9	0.22			104	-0.01
12	70.8	-0.01	28.6	-0.14	105	0.04	104	-0.01
13	73.48	0.16	30.51	0.16			103.5	-0.03
15	80.7	0.62	31.8	0.36	105	0.04		
16	74.3	0.21	31.5	0.31			113	0.38



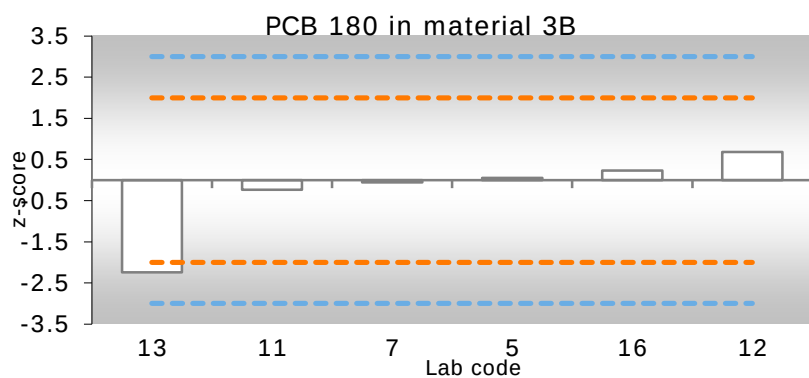
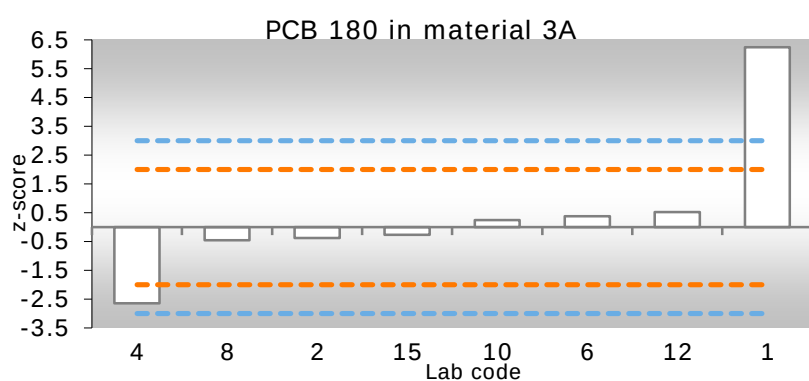
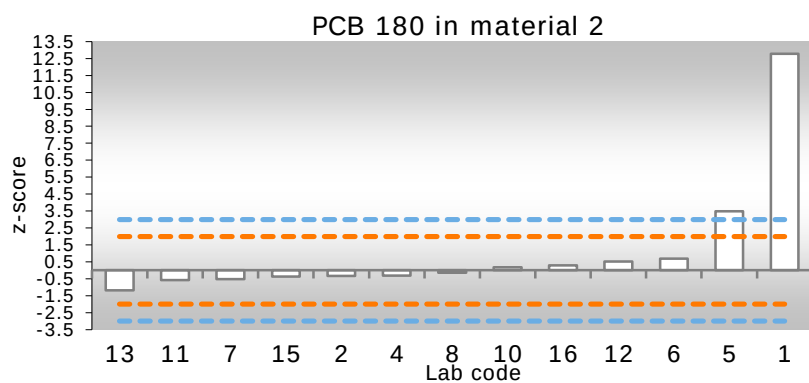
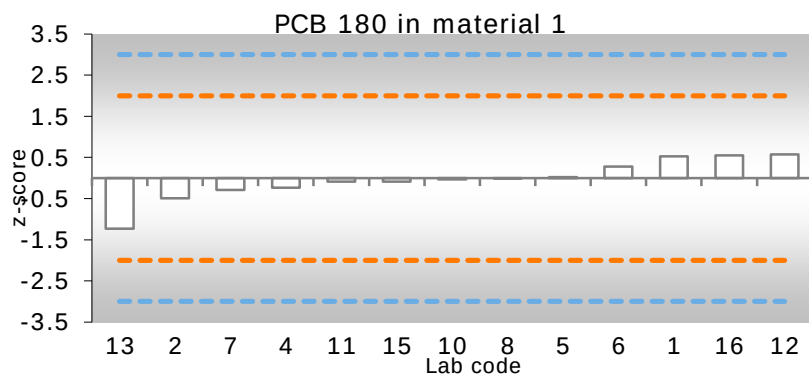
Lab code	PCB 167 (material 1)		PCB 167 (material 2)		PCB 167 (material 3a)		PCB 167 (material 3b)	
	AV: 71.9 ng / kg		AV: 67.9 ng / kg		AV: 151 ng / kg		AV: 164 ng / kg	
	Uncertainty of AV: 1.48 ng / kg		Uncertainty of AV: 2.46 ng / kg		Uncertainty of AV: 8.86 ng / kg		Uncertainty of AV: 5.33 ng / kg	
	Target sd: 15.8 ng / kg		Target sd: 14.9 ng / kg		Target sd: 32.1 ng / kg		Target sd: 34.4 ng / kg	
	Robust sd: 4.42 ng / kg		Robust sd: 7.36 ng / kg		Robust sd: 20.1 ng / kg		Robust sd: 11.3 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	71	-0.06	67	-0.06	148	-0.10		
2	67.5	-0.28	62.9	-0.34	148	-0.10		
3	72.3	0.03	66.7	-0.08			155	-0.26
4	62.59	-0.59	59.71	-0.55	136.89	-0.44		
5	72.8	0.06	64.7	-0.22			158	-0.18
6	66.4	-0.35	60.1	-0.52	123.2	-0.87		
7	63	-0.56	60	-0.53			151	-0.38
8	69.87	-0.13	66.1	-0.12	145.99	-0.16		
9								
10	75.03	0.20	74.815	0.46	184.825	1.05		
11	82.9	0.70	77	0.61			171	0.20
12	73.3	0.09	71.6	0.25	164	0.40	165	0.03
13	74.16	0.14	67.21	-0.05			171.23	0.21
15	73.2	0.08	74.4	0.43	167	0.49		
16	84.3	0.79	81.1	0.88			177	0.38



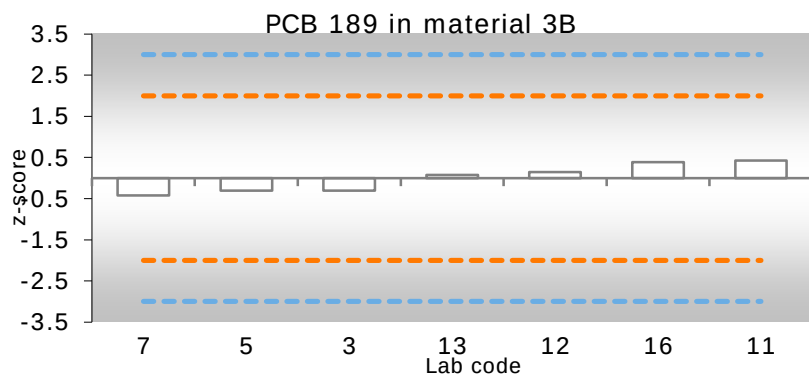
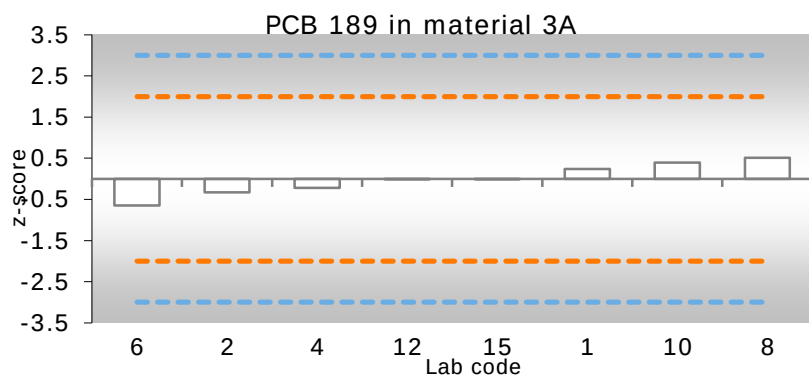
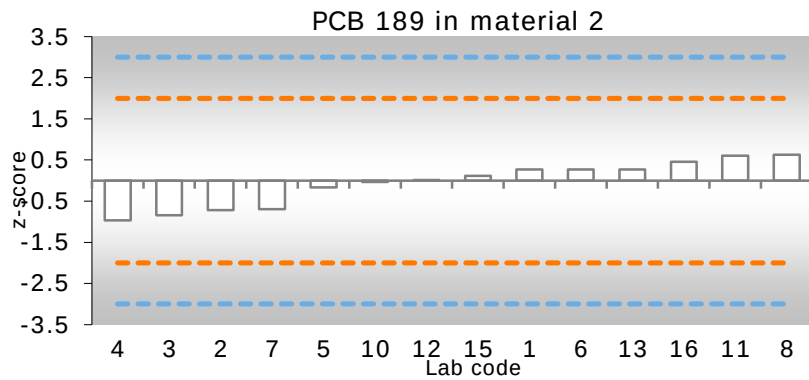
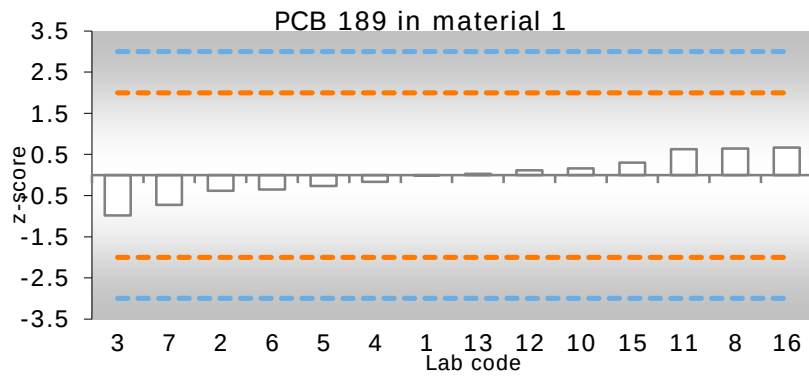
Lab code	PCB 169 (material 1)		PCB 169 (material 2)		PCB 169 (material 3a)		PCB 169 (material 3b)	
	AV: 5.01 ng / kg Uncertainty of AV: 0.12 ng / kg Target sd: 1.10 ng / kg Robust sd: 0.36 ng / kg		AV: 1.74 ng / kg Uncertainty of AV: 0.12 ng / kg Target sd: 0.38 ng / kg Robust sd: 0.35 ng / kg		AV: 3.93 ng / kg Uncertainty of AV: 0.08 ng / kg Target sd: 0.86 ng / kg Robust sd: 0.17 ng / kg		AV: 3.97 ng / kg Uncertainty of AV: 0.15 ng / kg Target sd: 0.87 ng / kg Robust sd: 0.33 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
1	4.3	-0.64	1.4	-0.85	3.9	-0.03		
2	5.11	0.09	1.7	-0.10	3.94	0.01		
3	2.112	-2.63	1	-1.85			1.612	-2.70
4	5.27	0.24	1.73	-0.03	4.09	0.19		
5	4.61	-0.36	1.36	-0.95			3.27	-0.81
6	5	-0.01	2	0.65	3.3	-0.73		
7	4.6	-0.37	1.6	-0.35			4	0.03
8	5.9	0.81	1.93	0.47	4.51	0.67		
9								
10	5.05	0.04	2.13	0.97	3.98	0.06		
11	5.29	0.25	5	8.13			5	1.17
12	5.07	0.06	1.63	-0.28	3.93	0.00	3.89	-0.10
13	5.14	0.12	2	0.65			4.18	0.24
15	4.89	-0.11	1.5	-0.60	3.59	-0.39		
16	5.39	0.35	1.91	0.42			4.12	0.17



Lab code	PCB 180 (material 1)		PCB 180 (material 2)		PCB 180 (material 3a)		PCB 180 (material 3b)	
	AV: 2893 ng / kg Uncertainty of AV: 56.6 ng / kg Target sd: 394 ng / kg Robust sd: 163 ng / kg		AV: 626 ng / kg Uncertainty of AV: 24.8 ng / kg Target sd: 107 ng / kg Robust sd: 71.4 ng / kg		AV: 975 ng / kg Uncertainty of AV: 49.6 ng / kg Target sd: 157 ng / kg Robust sd: 112 ng / kg		AV: 6955 ng / kg Uncertainty of AV: 169 ng / kg Target sd: 831 ng / kg Robust sd: 330 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z' _a -score	Result (ng / kg)	z _a -score
1	3100	0.52	2000	12.78	2000	6.24		
2	2700	-0.49	590	-0.34	912	-0.38		
3								
4	2799.4	-0.24	592.8	-0.31	539.22	-2.65		
5	2900	0.02	1000	3.48			7000	0.05
6	3003	0.28	701	0.70	1037	0.38		
7	2780	-0.29	570	-0.52			6910	-0.05
8	2890	-0.01	610	-0.15	900	-0.46		
9								
10	2879.045	-0.04	644.82	0.17	1015.29	0.25		
11	2860	-0.08	563	-0.59			6760	-0.23
12	3120	0.58	681	0.51	1060	0.52	7524	0.68
13	2408	-1.23	500	-1.17			5093	-2.24
15	2860	-0.08	587	-0.36	930	-0.27		
16	3110	0.55	657	0.29			7150	0.23



Lab code	PCB 189 (material 1)		PCB 189 (material 2)		PCB 189 (material 3a)		PCB 189 (material 3b)	
	AV: 76.1 ng / kg Uncertainty of AV: 2.92 ng / kg Target sd: 16.7 ng / kg Robust sd: 8.8 ng / kg		AV: 9.44 ng / kg Uncertainty of AV: 0.36 ng / kg Target sd: 2.08 ng / kg Robust sd: 1.09 ng / kg		AV: 112 ng / kg Uncertainty of AV: 4.74 ng / kg Target sd: 24.6 ng / kg Robust sd: 10.7 ng / kg		AV: 112 ng / kg Uncertainty of AV: 4.74 ng / kg Target sd: 24.7 ng / kg Robust sd: 10.0 ng / kg	
	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score	Result (ng / kg)	z _a -score
	1	76	-0.01	10	0.27	118	0.24	
	2	69.7	-0.38	7.96	-0.71	104	-0.33	
3	59.6	-0.98	7.7	-0.84			105	-0.30
4	73.33	-0.16	7.44	-0.96	106.58	-0.22		
5	71.6	-0.27	9.1	-0.17			104.9	-0.31
6	70.2	-0.35	10	0.27	96	-0.65		
7	64	-0.72	8	-0.70			102	-0.42
8	86.81	0.64	10.75	0.63	124.59	0.51		
9								
10	78.84	0.16	9.37	-0.04	121.675	0.39		
11	86.6	0.63	10.7	0.60			123	0.43
12	78	0.11	9.48	0.02	112	0.00	116	0.14
13	76.58	0.03	10	0.27			114.4	0.08
15	81.1	0.30	9.68	0.11	112	0.00		
16	87.2	0.66	10.4	0.46			122	0.39



Annex 6 Overall results: questionable/unsatisfactory z-scores

Lab code	Material	PCDD /Fs		PCBs	
		Congeners	Totals	Congeners	Totals
1	material 1			1	
	material 2	4		4	
	material 3			6	
2	material 1			1	
	material 2	1			
	material 3				
3	material 1			3	3
	material 2	2		2	3
	material 3			2	3
4	material 1	4			
	material 2	5	3	1	
	material 3	4		3	
5	material 1	1			
	material 2	8		2	
	material 3	1			
6	material 1	1			
	material 2	4		1	
	material 3	1		1	
7	material 1				
	material 2	1		1	
	material 3	1			
8	material 1			1	
	material 2	3			
	material 3			1	
9	material 1				1
	material 2		1		
	material 3				1
10	material 1	5			
	material 2	12			
	material 3	6			
11	material 1				
	material 2	4		2	
	material 3			1	
12	material 1				
	material 2	1			
	material 3				
13	material 1	1		1	
	material 2	7		2	
	material 3	1		2	
15	material 1				
	material 2	2			
	material 3				
16	material 1	1			
	material 2	2			
	material 3	2			

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The mission of Wageningen UR (University & Research centre) is 'To explore the potential of nature to improve the quality of life'. Within Wageningen UR, nine specialised research institutes of the DLO Foundation have joined forces with Wageningen University to help answer the most important questions in the domain of healthy food and living environment. With approximately 30 locations, 6,000 members of staff and 9,000 students, Wageningen UR is one of the leading organisations in its domain worldwide. The integral approach to problems and the cooperation between the various disciplines are at the heart of the unique Wageningen Approach.

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