

**University of Stuttgart**  
Germany



# Analytische Qualitätssicherung Baden-Württemberg

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Proficiency Test 4/23

- TW S3 – pharmaceuticals in drinking water -  
sulfamethoxazole, sulfadimidine, trimethoprim, candesartan, valsartan,  
gabapentin, carbamazepine, metoprolol, sotalol

Final report

Provided by

AQS Baden-Württemberg am  
Institut für Siedlungswasserbau, Wassergüte- und  
Abfallwirtschaft der Universität Stuttgart  
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and

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Stuttgart, in September 2023

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<b>Version of the report</b>	1.0	

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## 1. General

This PT was provided by AQS Baden-Württemberg in cooperation with IWW Water Center in Mülheim an der Ruhr and with the network "NORMAN" (Network of reference laboratories for monitoring of emerging environmental pollutants). In this round following parameters were to be determined:

Zu analysierende Parameter	CAS-Nummer der zu analysierenden Parameter
Sulfamethoxazole	723-46-6
Sulfadimidine	57-68-1
Trimethoprim	738-70-5
Candesartan	139481-59-7
Valsartan	137862-53-4
Gabapentin	60142-96-3
Carbamazepine	298-46-4
Metoprolol	56392-17-7
Sotalol	959-24-0

The PT was executed and evaluated according to the requirements of DIN 38402-A45 and ISO/TS 20612.

## 2. PT design

Each participant received the following samples:

- 3 sample in 250 ml glass bottles, preserved by adding 40 mg/l sodium azide. The samples also contained acetonitrile as solubiliser.

3 different concentration levels/batches were produced. All participants received the same samples.

## 3. Sample preparation

The samples were based on a real drinking water matrix. The drinking water was used without treatment for the sample preparation.

The drinking water was spiked with standard solutions and the concentrations covered drinking and ground water relevant ranges.

## 4. Sample distribution

The samples were dispatched on 9 May 2023 by express service.

## 5. Analysenverfahren

The participants were free to choose a suitable method, but a limit of quantification of 0,02 µg/l was required.

The participants were informed that the samples had to be analysed in the own laboratory, with own personal and own equipment. Subcontracting of the analysis was not allowed.

The samples had to be analysed in duplicate over the complete method (sample preparation and measurement). The participants were asked to report the results in µg/l with three significant digits.

## 6. Submission of the results

The deadline for the submission of results was on 12 June 2023.

## 7. Basic principle of evaluation and assessment

The basic principle of the evaluation and assessment of the PTs from AQS Baden-Württemberg are described in the document „Evaluation of the PTs and information for the report“, which can be downloaded from [www.aqsbw.de/pdf/ausw\\_berichte\\_v1\\_en.pdf](http://www.aqsbw.de/pdf/ausw_berichte_v1_en.pdf).

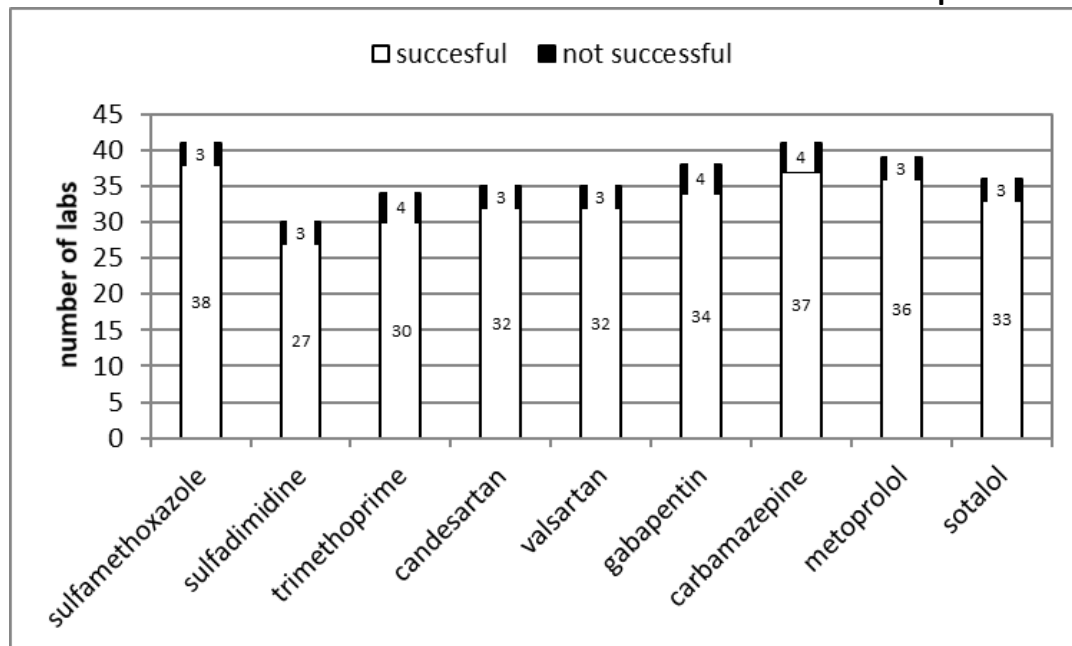
This PT was evaluated as follows:

<b>Assigned value <math>x_{pt}</math>:</b>	Robust mean value from participants' results (Hampel estimator)						
<b>Standard deviation for proficiency assessment <math>\sigma_{pt}</math>:</b>	Q method						
<b>Upper limit of <math>\sigma_{pt}</math>:</b>	25 %						
<b>Lower limit of <math>\sigma_{pt}</math>:</b>	5 %						
<b>Assessment:</b>	$z_U$ Score						
<b>Classification of the single results:</b>	<table style="border: none; width: 100%;"> <tr> <td style="padding-right: 20px;"><math> z_u  \leq 2,0</math></td> <td>successful</td> </tr> <tr> <td><math>2,0 &lt;  z_u  &lt; 3,0</math></td> <td>questionable</td> </tr> <tr> <td><math> z_u  \geq 3,0</math></td> <td>unsatisfactory</td> </tr> </table>	$ z_u  \leq 2,0$	successful	$2,0 <  z_u  < 3,0$	questionable	$ z_u  \geq 3,0$	unsatisfactory
$ z_u  \leq 2,0$	successful						
$2,0 <  z_u  < 3,0$	questionable						
$ z_u  \geq 3,0$	unsatisfactory						
<b>Parameter assessment:</b>	A parameter was assessed as successful, if more than half of the values were correctly determined (2 out of 3 values are within the tolerance limits).						

## 8. Auswertung

<b>Number of participants:</b>	43 all laboratories reported results
<b>Number of reported values</b>	983
<b>Number of accepted values:</b>	894 (90,9 %)

### Illustration of the successful and not successful laboratories for each parameter



## 9. Explanation for the appendices

The explanations for the appendices can be found in the document „Evaluation of the PTs and information for the report“, which can be downloaded from [www.aqsbw.de/pdf/ausw\\_berichte\\_v1\\_en.pdf](http://www.aqsbw.de/pdf/ausw_berichte_v1_en.pdf).

## 10. Measurement uncertainty (MU)

### General:

Number of labs with valid values	43
Number of labs with valid values and reported measurement uncertainties	30 (69,8 %)
Number of valid values	983
Number of valid values with measurement uncertainties	665 (67,7 %)

**Measurement uncertainties against the accreditation status:**

Accreditation status of the values	Number of	
accredited	765	579 (75,7 %)
not accredited	95	32 (33,7 %)
not specified	123	54 (43,9 %)

**Interpretation of the reported measurement uncertainties:**

If measurement uncertainties are underestimated values assessed as “satisfactory” in the PT ( $|z_U| \leq 2$ ), will have a large  $\zeta$ -score.  $|\zeta| > 2$  means that the “own” requirements (defined in terms of estimated uncertainty) are not fulfilled.

<b>Number of values with reported measurement uncertainty having a <math> z_U  \leq 2,0</math></b>	600
<b>Number of values with a magnitude of <math>\zeta</math>-scores <math>&gt; 2</math></b> The own requirements of the laboratory are not fulfilled and the estimation of the measurement uncertainty is too low	60 (10,0 %)

**11. Traceable reference values**

The explanations about traceable reference values can be found in the document „Evaluation of the PTs and information for the report“, which can be downloaded from [www.aqsbw.de/pdf/ausw\\_berichte\\_v1\\_en.pdf](http://www.aqsbw.de/pdf/ausw_berichte_v1_en.pdf)

**12. Internet**

The report is available on [www.aqsbw/pdf/279/report\\_279.pdf](http://www.aqsbw/pdf/279/report_279.pdf)

# sulfamethoxazole

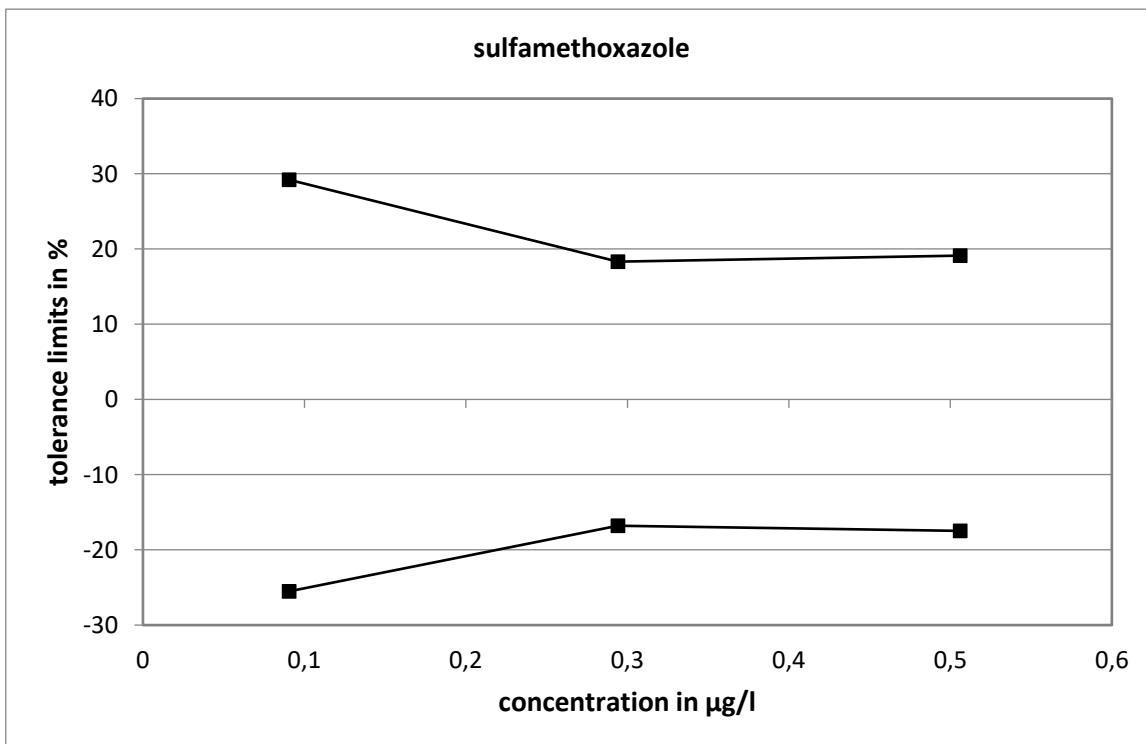
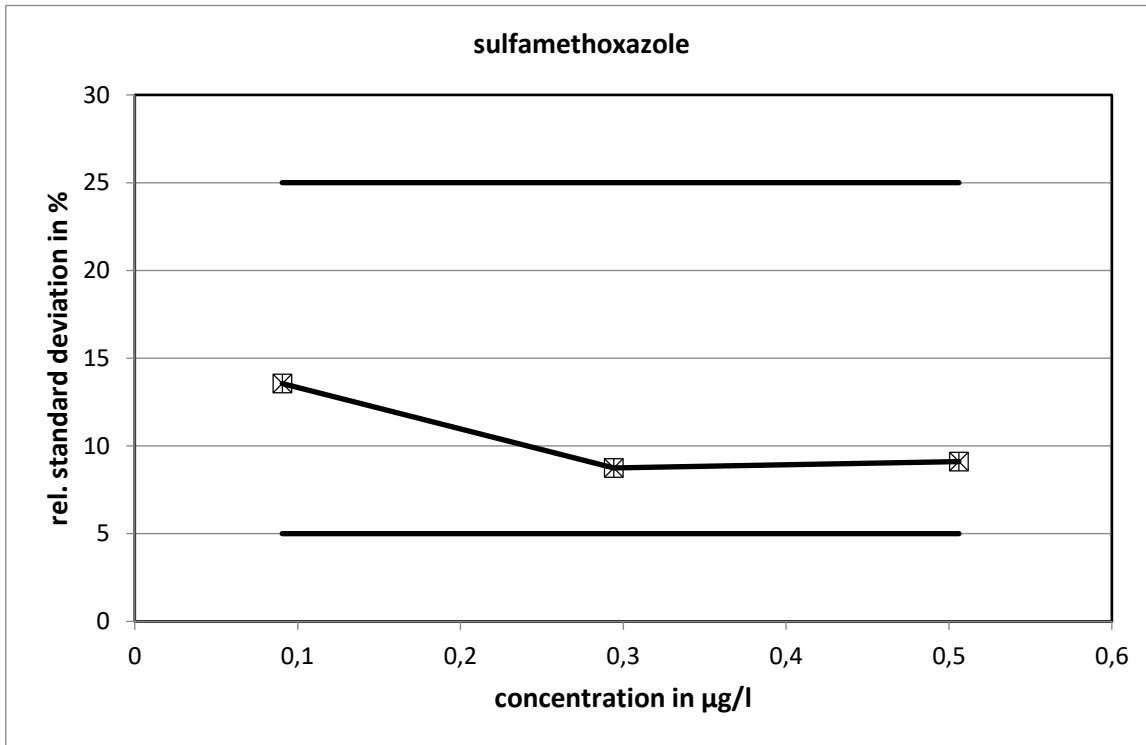
level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,0906	5,29	0,0123	0,0123	13,55	0,1170	0,0675	29,20	-25,51	41	0	2	4,9
2	0,2941	3,41	0,0257	0,0257	8,74	0,3479	0,2447	18,32	-16,79	41	1	3	9,8
3	0,5061	3,60	0,0461	0,0461	9,11	0,6030	0,4177	19,13	-17,47	40	2	1	7,5
sum										122	3	6	7,4

## Recovery and matrix content

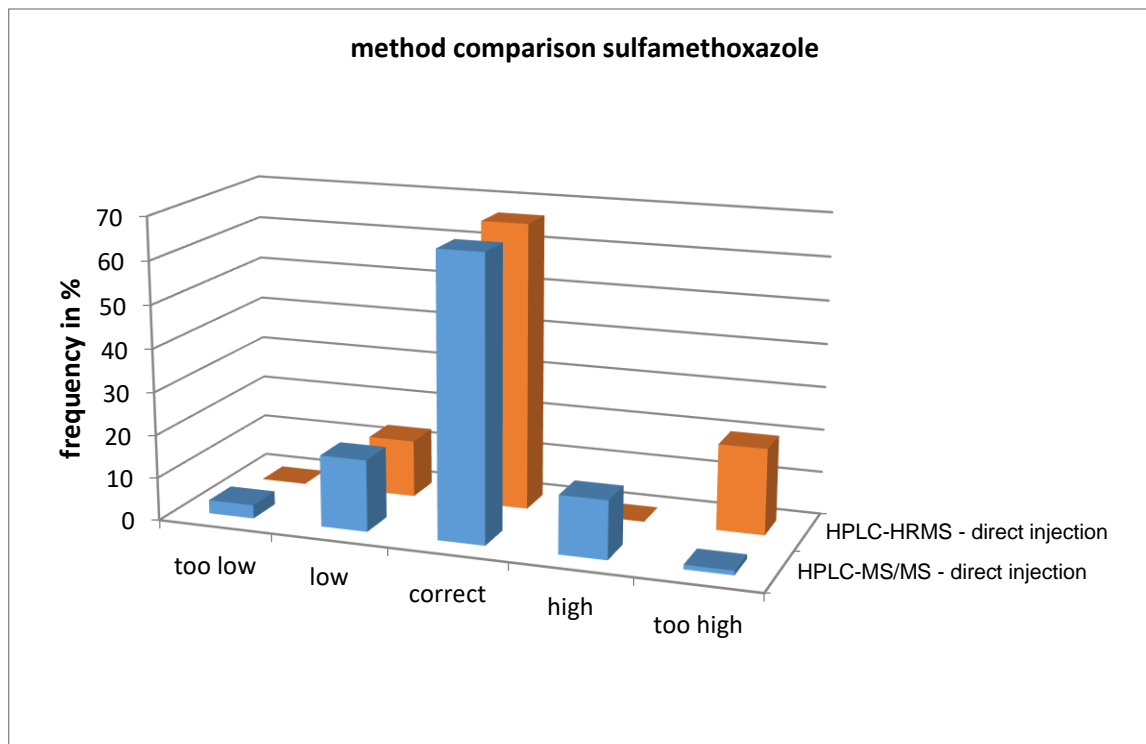
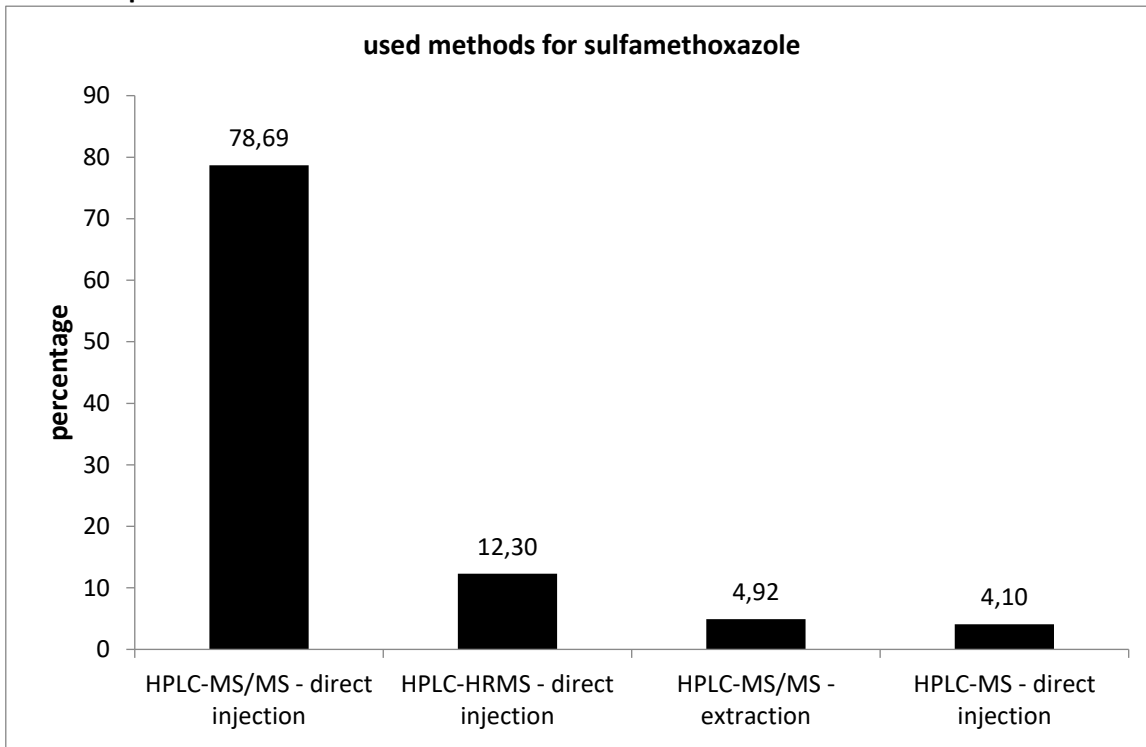


Slope of the regression line: 1,19; average recovery: 119 %  
no matrix content

Relative standard deviation and tolerance limits



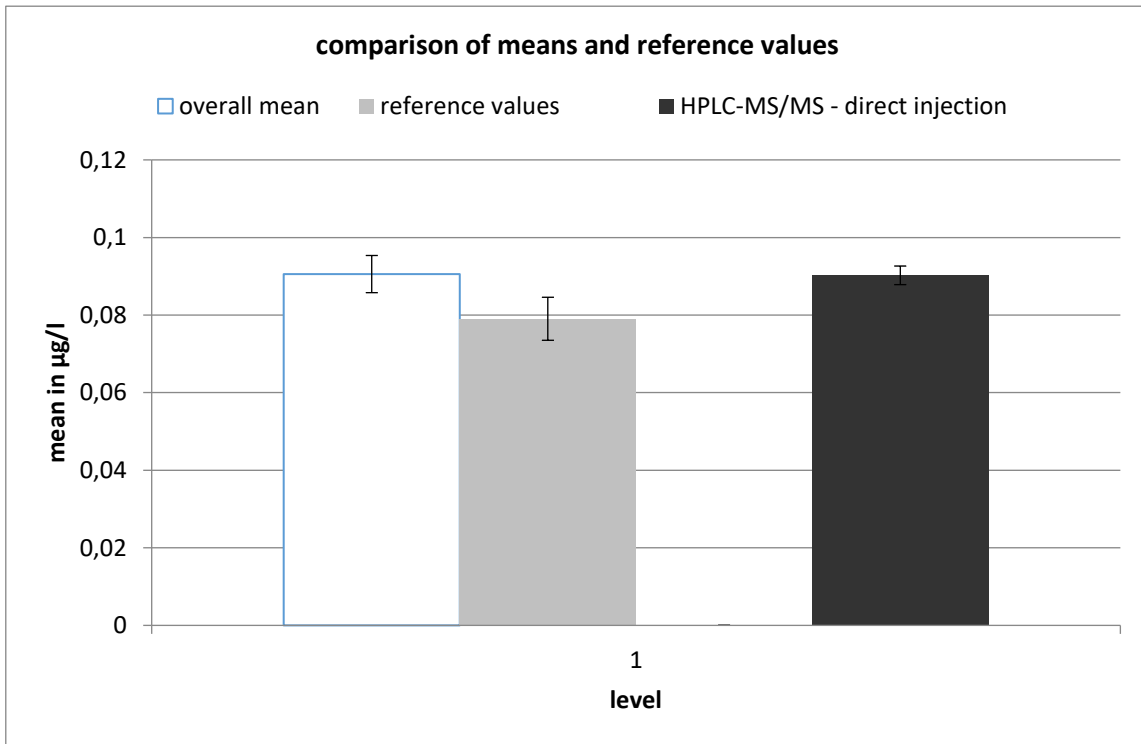
Method specific evaluation



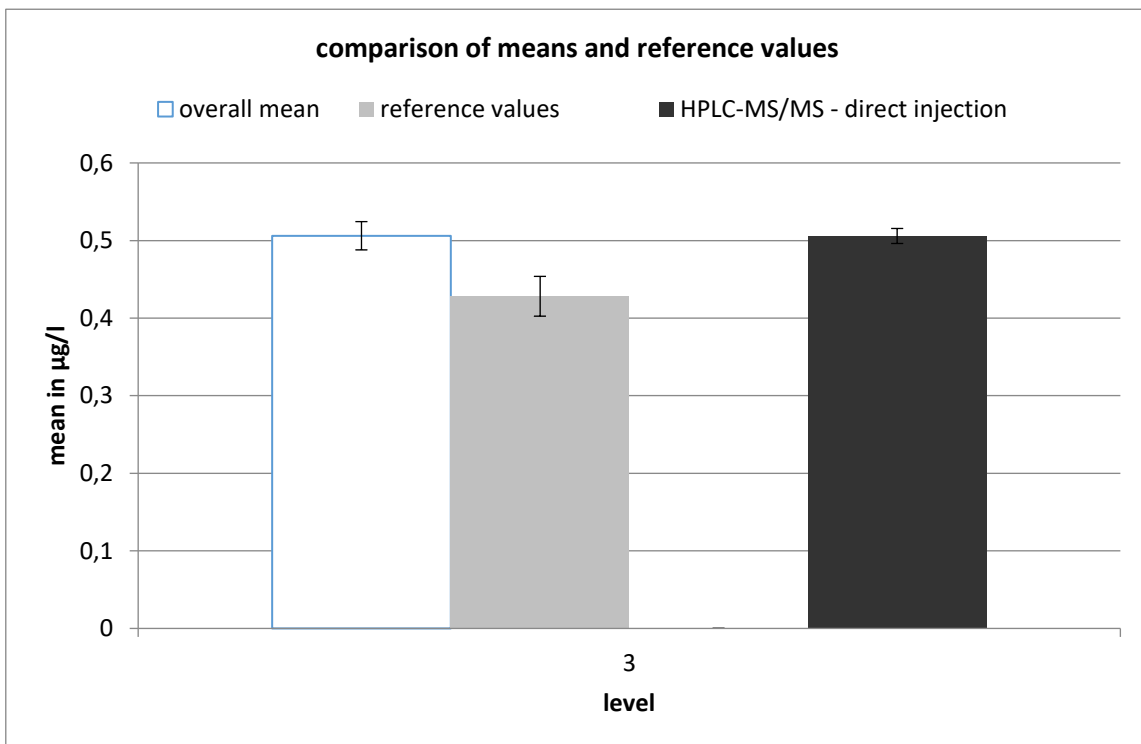
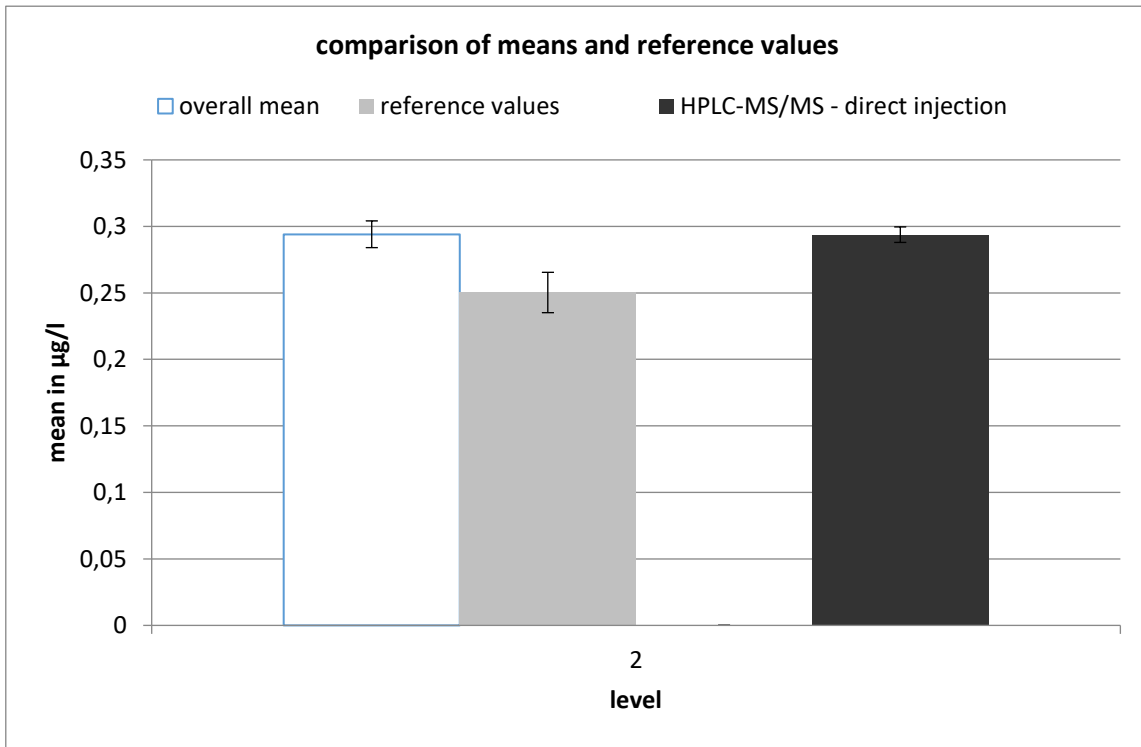
Given the small number of participants, no significant differences.

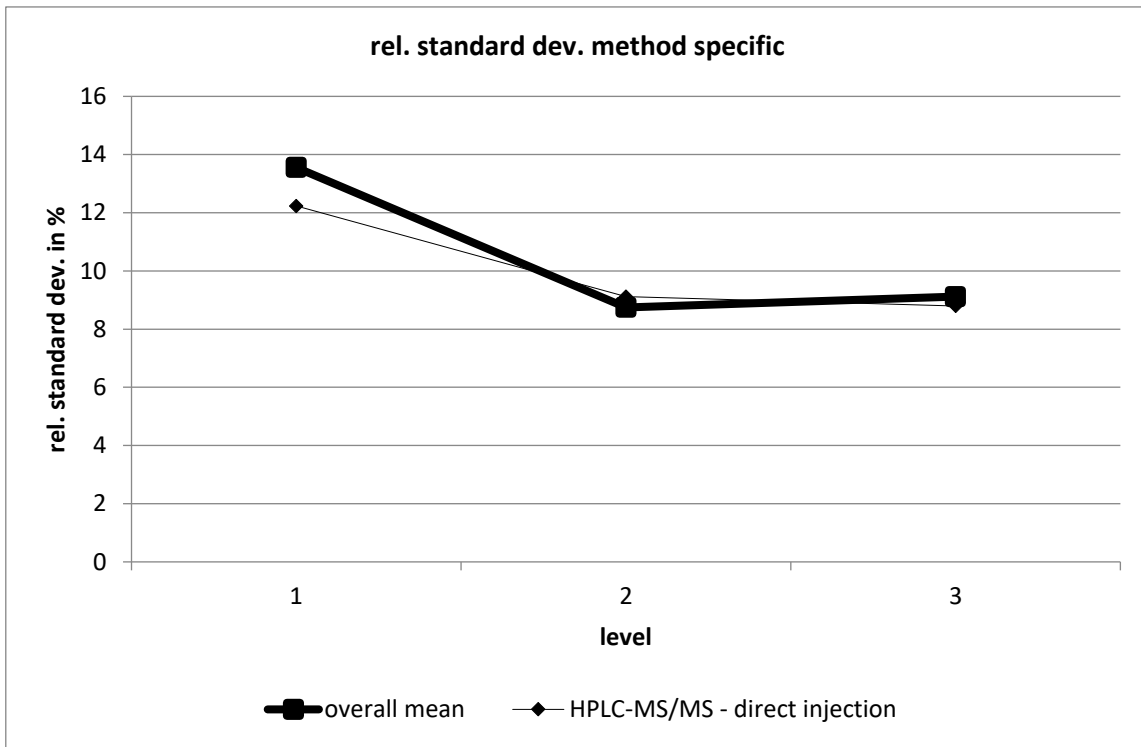
**Comparison of means and reference values**

level	mean [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]	reference value [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]
1	0,0906	0,0048	5,3	0,0790	0,0055	7,0
2	0,2941	0,0100	3,4	0,2503	0,0152	6,1
3	0,5061	0,0182	3,6	0,4281	0,0256	6,0







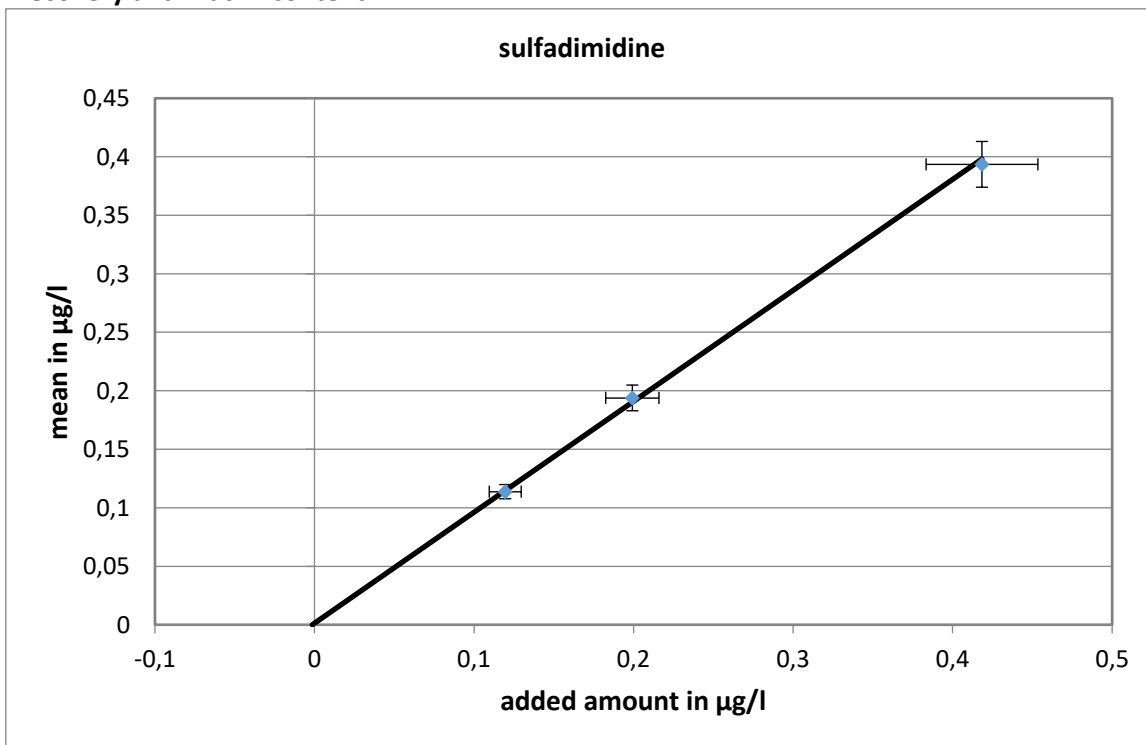


HPLC-MS/MS - direct injection									
level	robust mean [µg/l]	exp. unc. of the mean [µg/l]	exp. unc. of the mean [%]	robust standard deviation [µg/l]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,09	0,002	2,662	0,011	12,23	33	2	0	6,061
2	0,294	0,006	1,984	0,027	9,119	33	2	1	9,091
3	0,506	0,01	1,914	0,044	8,795	33	3	0	9,091

# sulfadimidine

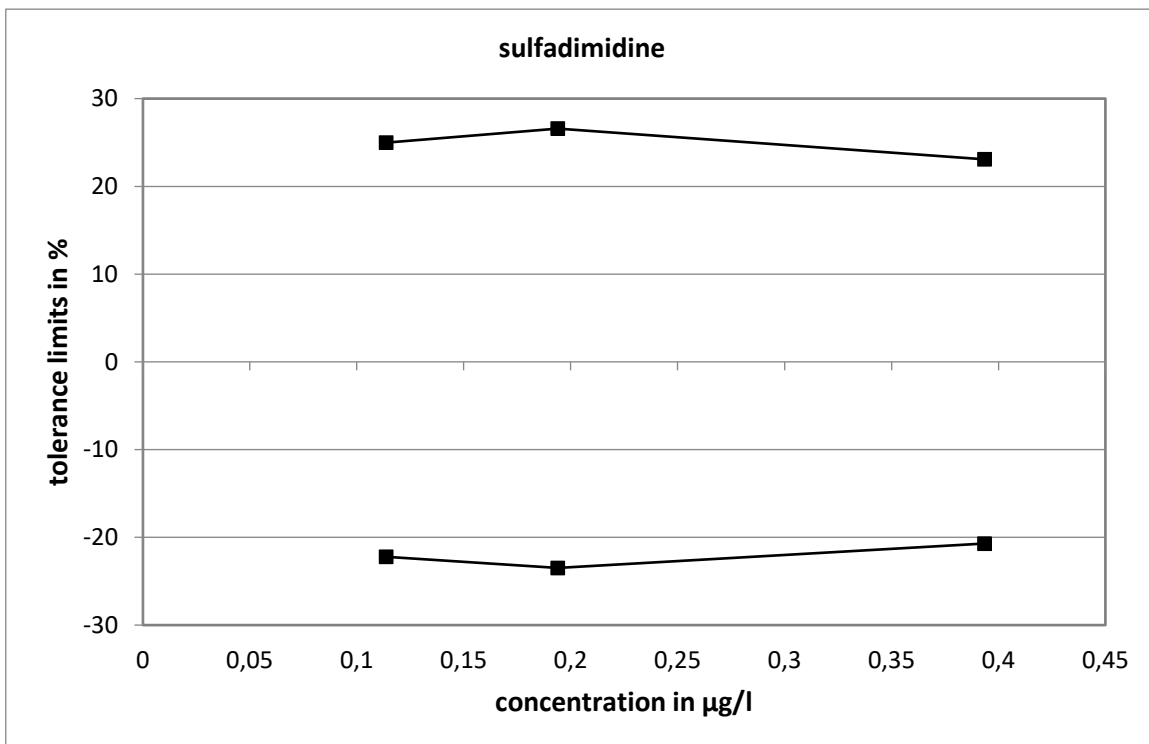
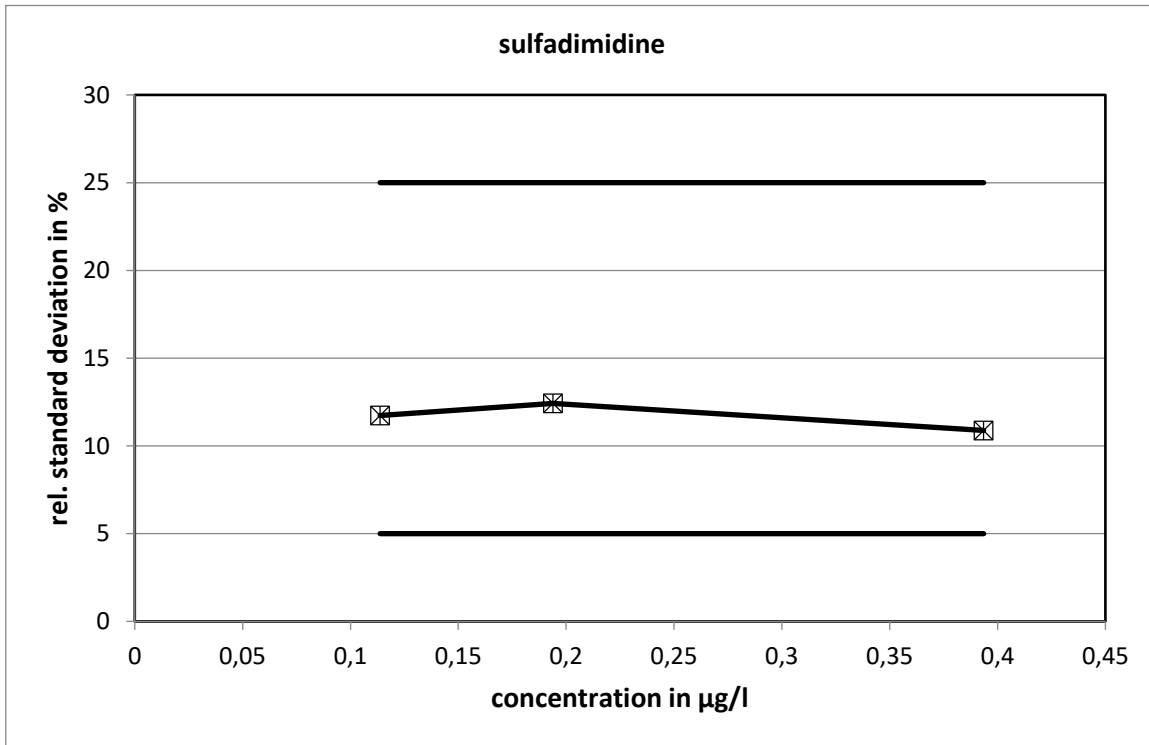
level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,1138	5,35	0,0133	0,0133	11,73	0,1422	0,0885	24,99	-22,24	30	0	4	13,3
2	0,1939	5,67	0,0241	0,0241	12,42	0,2454	0,1484	26,58	-23,49	30	1	4	16,7
3	0,3936	4,97	0,0428	0,0428	10,88	0,4844	0,3121	23,08	-20,71	30	0	2	6,7
sum										90	1	10	12,2

## Recovery and matrix content

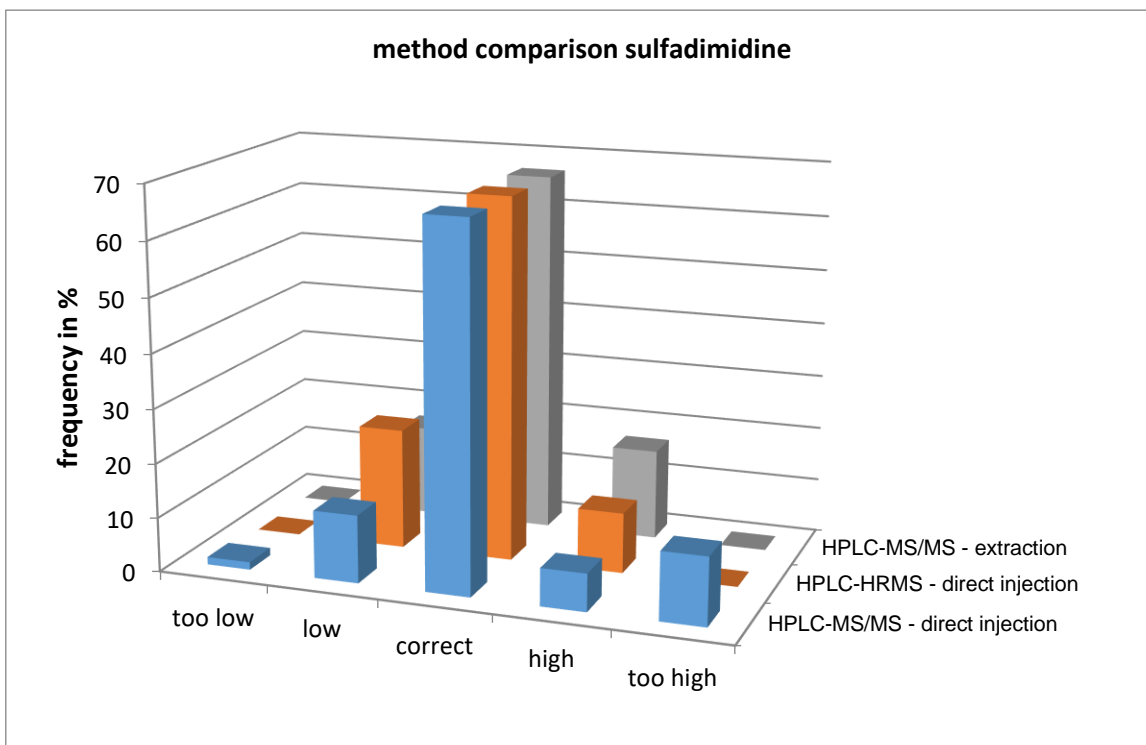
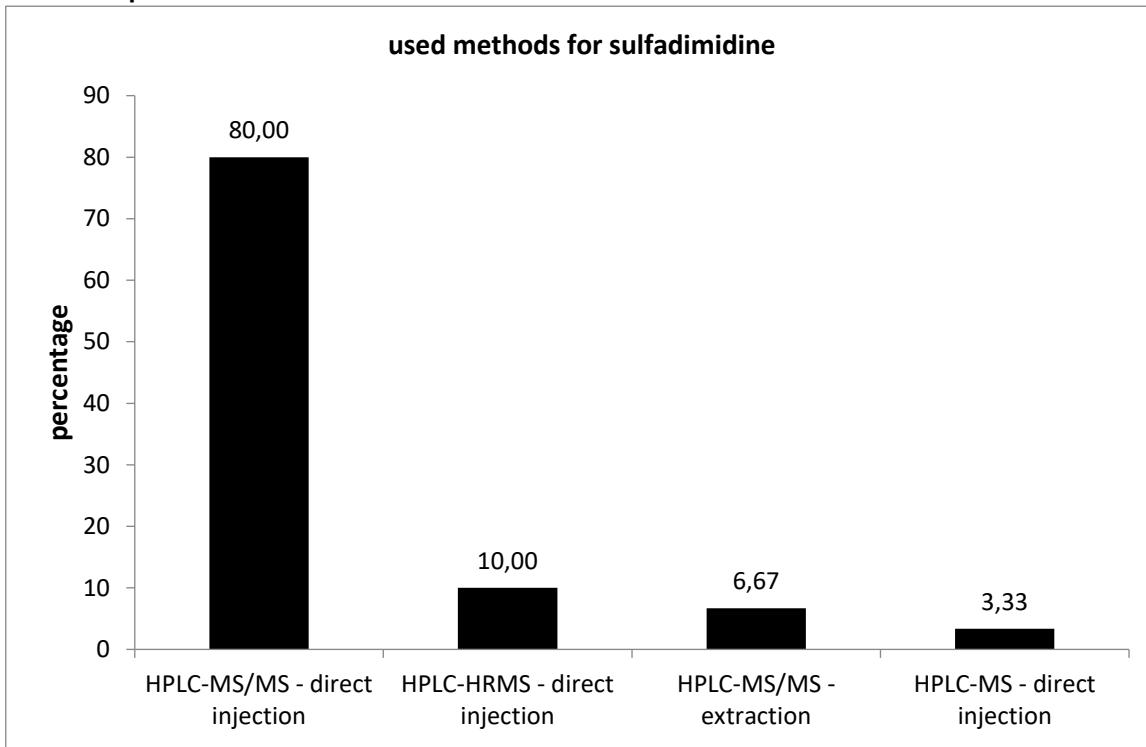


Steigung der Regressionsgeraden: 0,95; mittlere Wiederfindung: 95 %  
 calculated matrix content: 0,001 µg/l, uncertainty of the matrix content: 100%

Relative standard deviation and tolerance limits



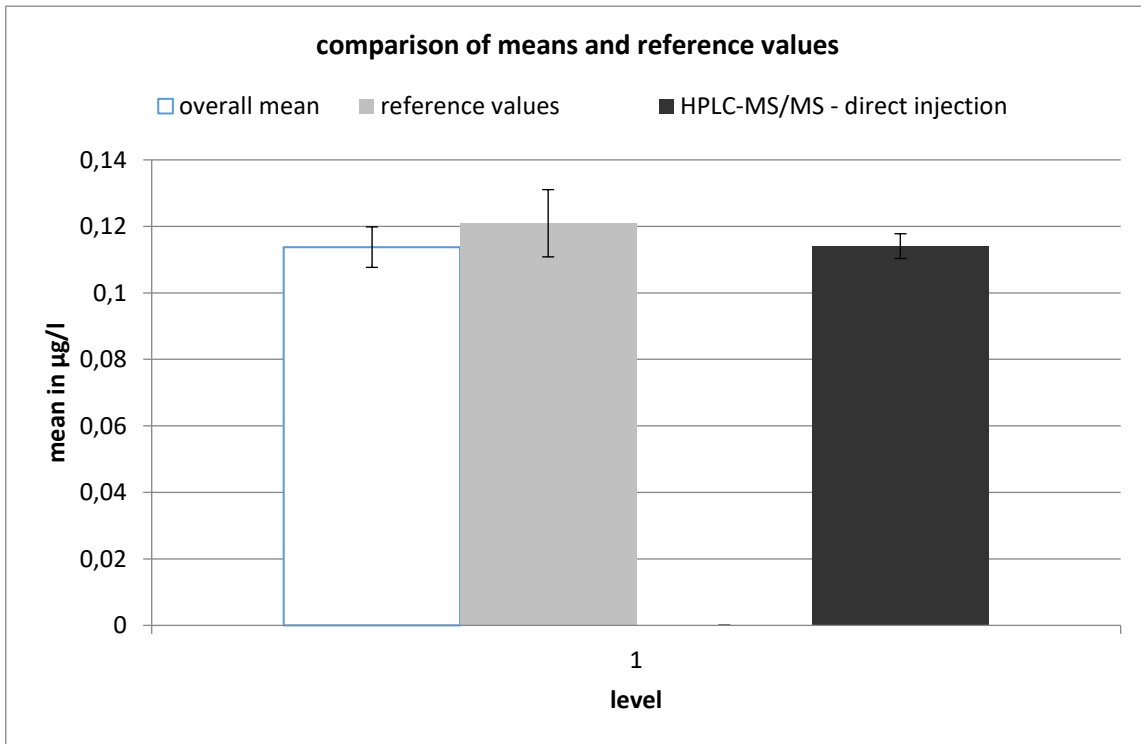
Method specific evaluation

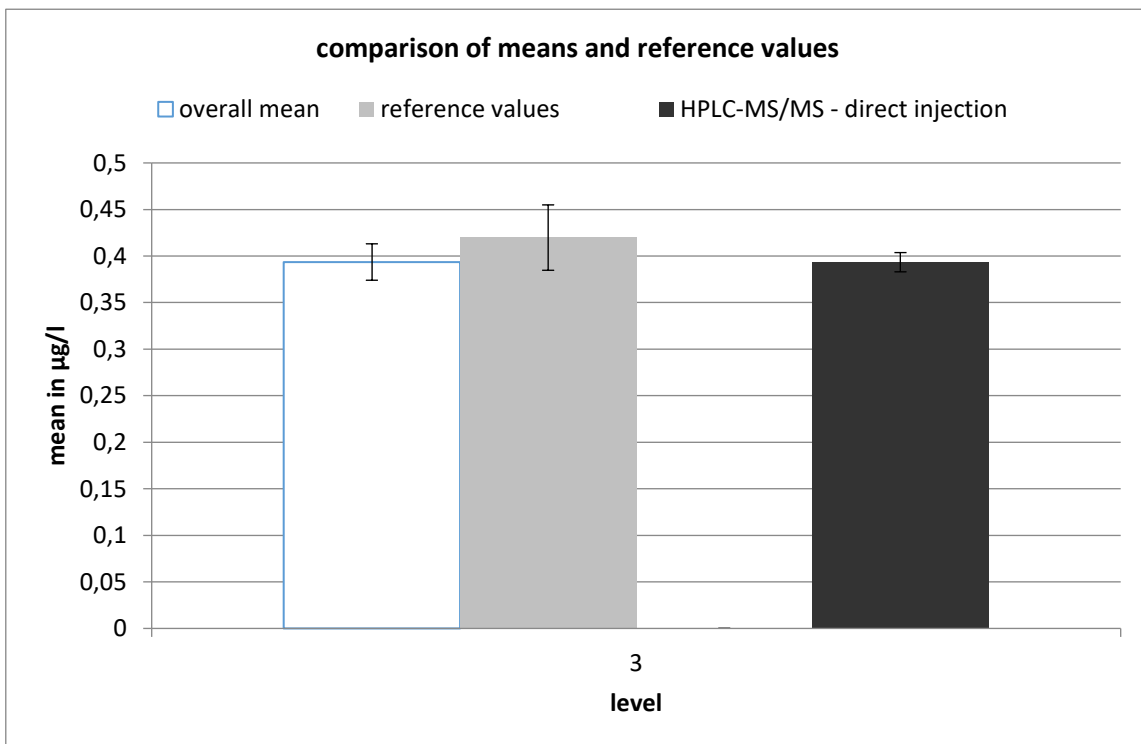
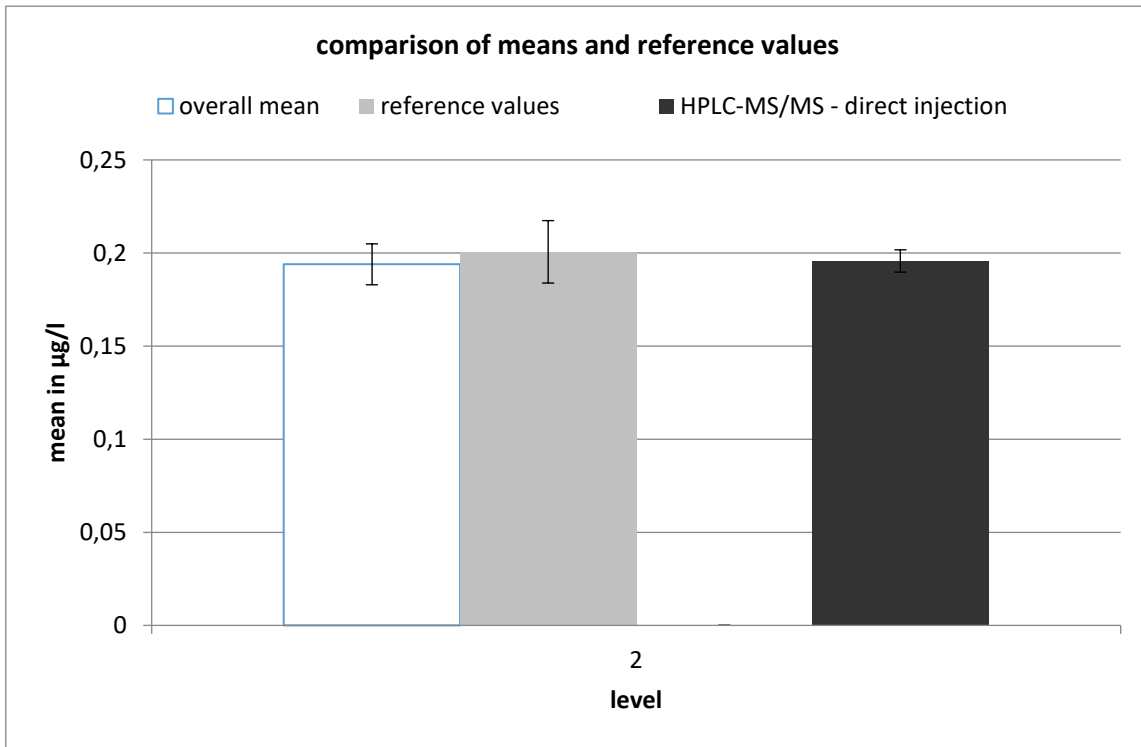


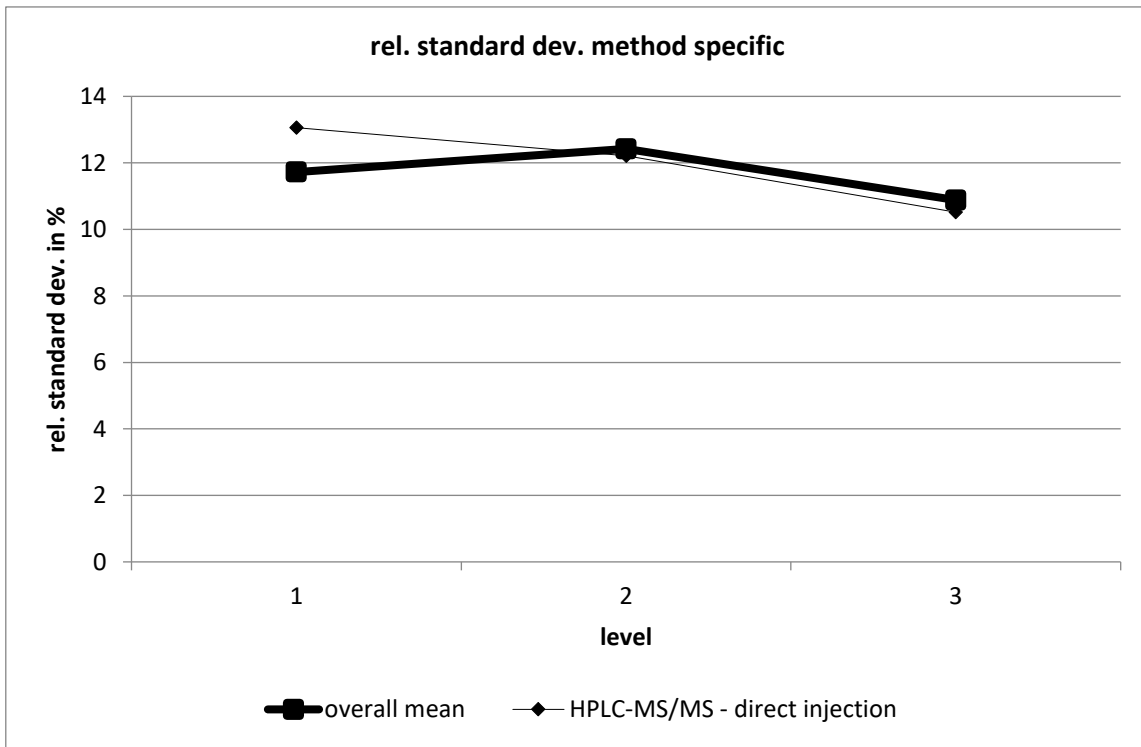
Given the small number of participants, no significant differences.

**Comparison of means and reference values**

level	mean [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]	reference value [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]
1	0,1138	0,0061	5,4	0,1209	0,0101	8,4
2	0,1939	0,0110	5,7	0,2006	0,0168	8,4
3	0,3936	0,0195	5,0	0,4198	0,0351	8,4







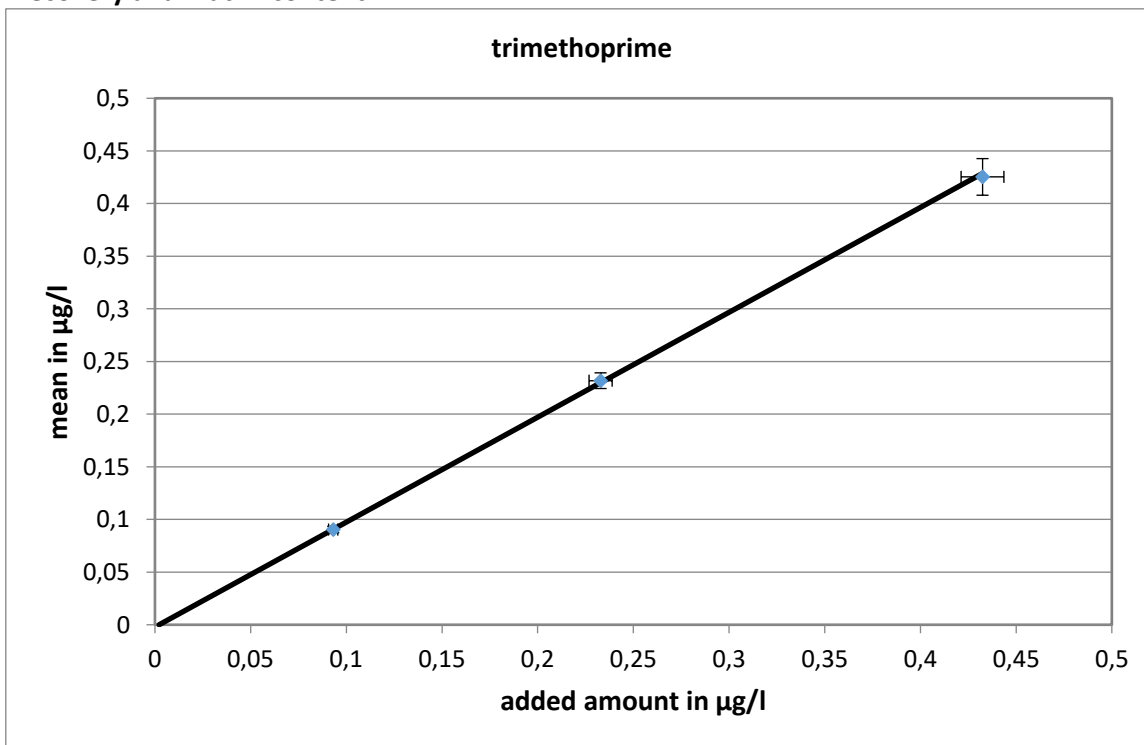
HPLC-MS/MS - direct injection									
level	robust mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [%]	robust standard deviation [ $\mu\text{g/l}$ ]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,114	0,004	3,265	0,015	13,06	25	0	5	20
2	0,196	0,006	3,053	0,024	12,21	25	1	4	20
3	0,393	0,01	2,629	0,041	10,52	25	0	3	12



# trimethoprim

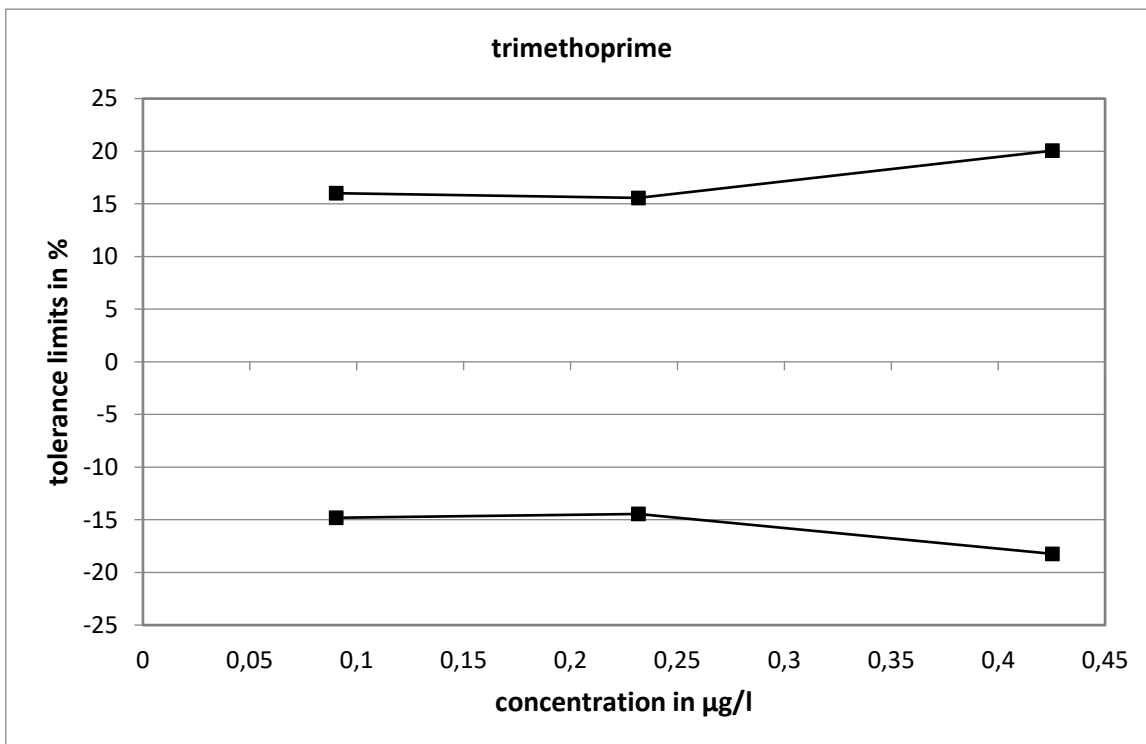
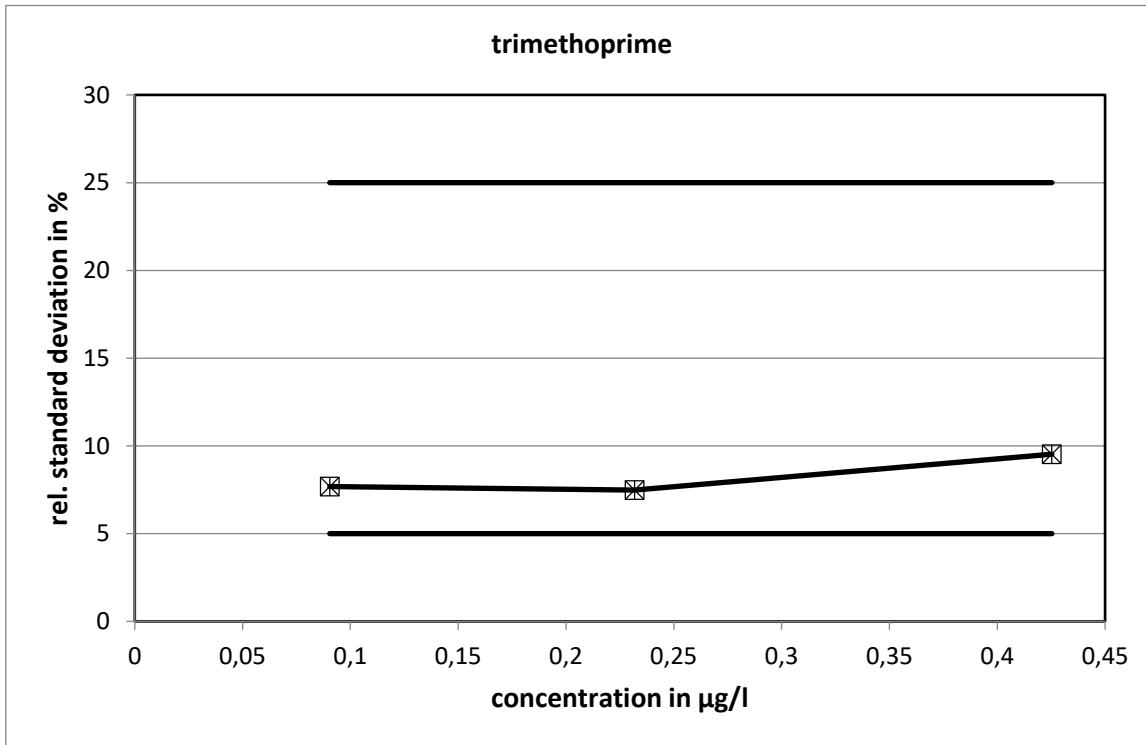
level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,0904	3,34	0,0069	0,0069	7,68	0,1049	0,0770	16,00	-14,82	33	2	3	15,2
2	0,2318	3,21	0,0173	0,0173	7,48	0,2679	0,1983	15,57	-14,45	34	2	2	11,8
3	0,4253	4,09	0,0405	0,0405	9,53	0,5106	0,3478	20,05	-18,23	34	2	2	11,8
sum										101	6	7	12,9

## Recovery and matrix content

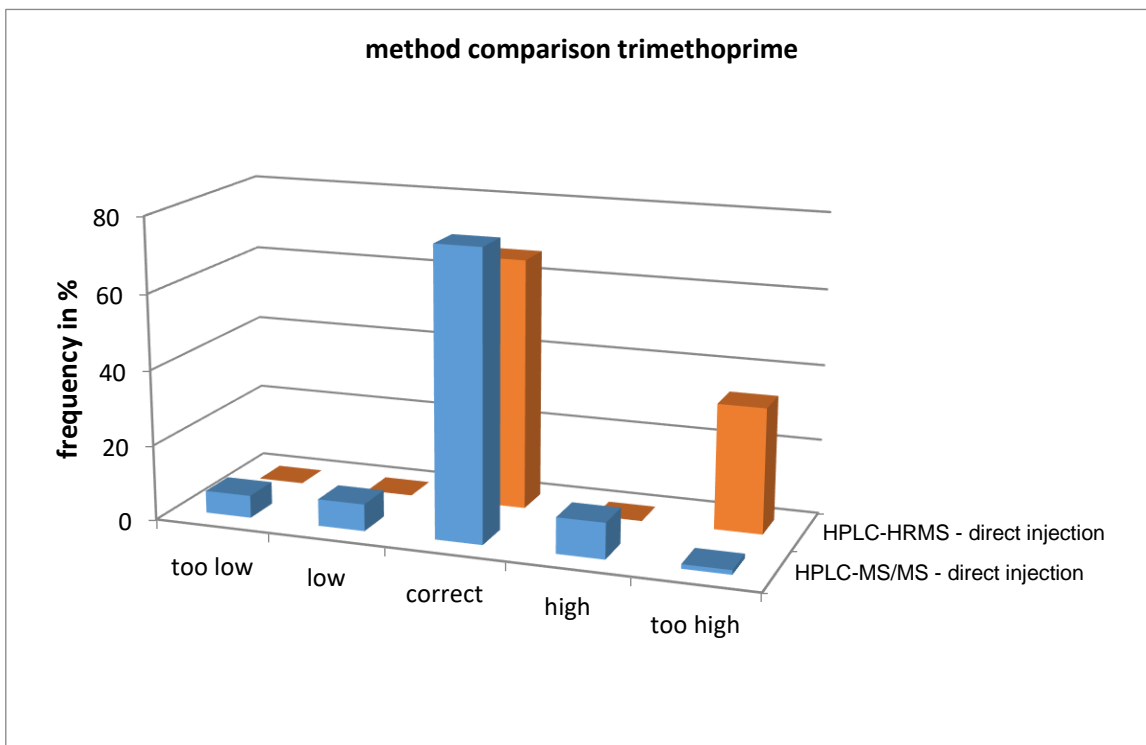
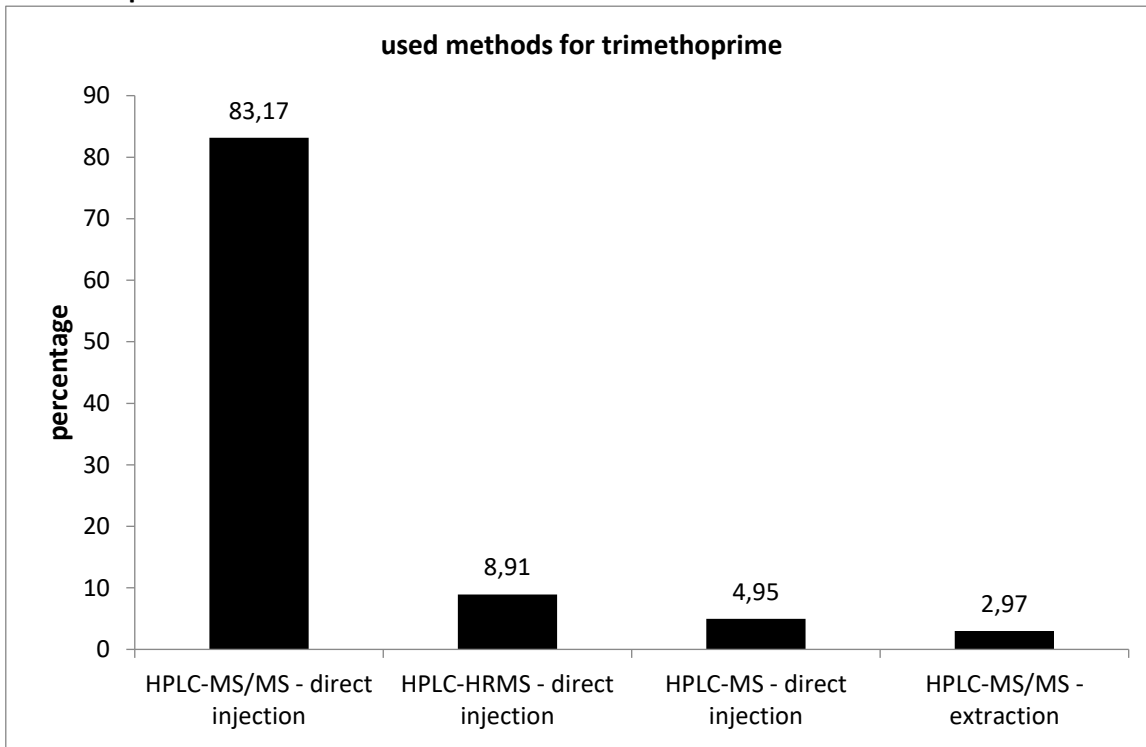


Slope of the regression line: 1,00; average recovery: 100 %  
no matrix content

Relative standard deviation and tolerance limits



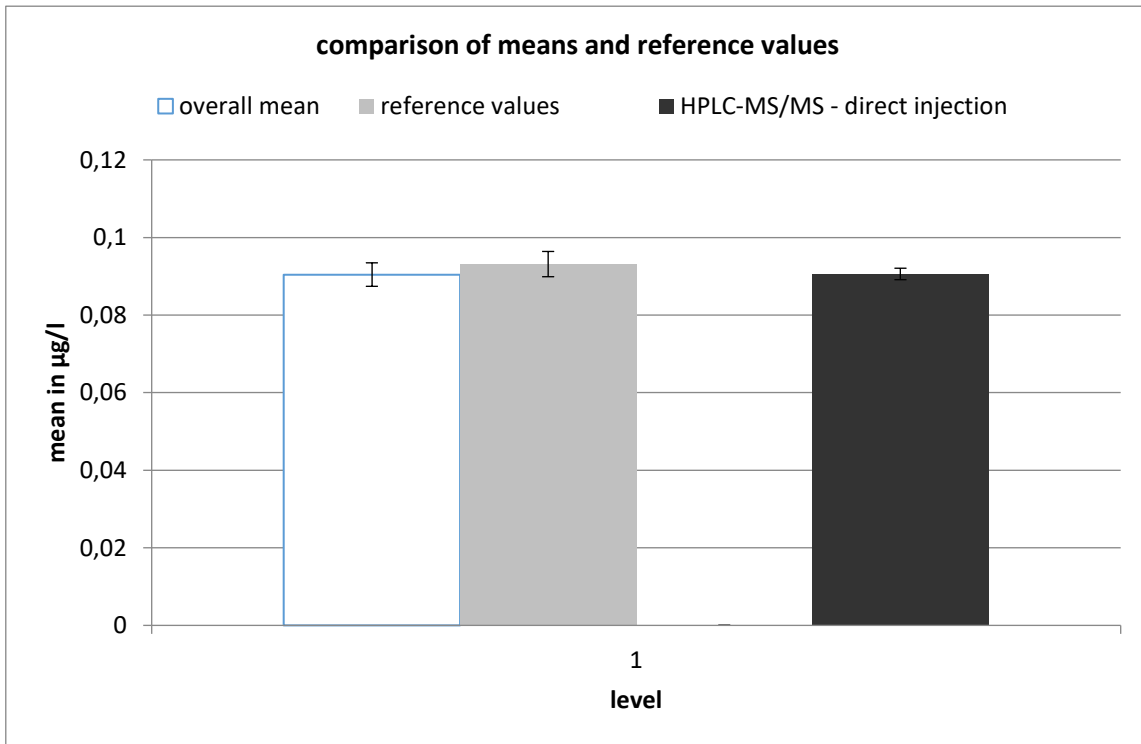
Method specific evaluation

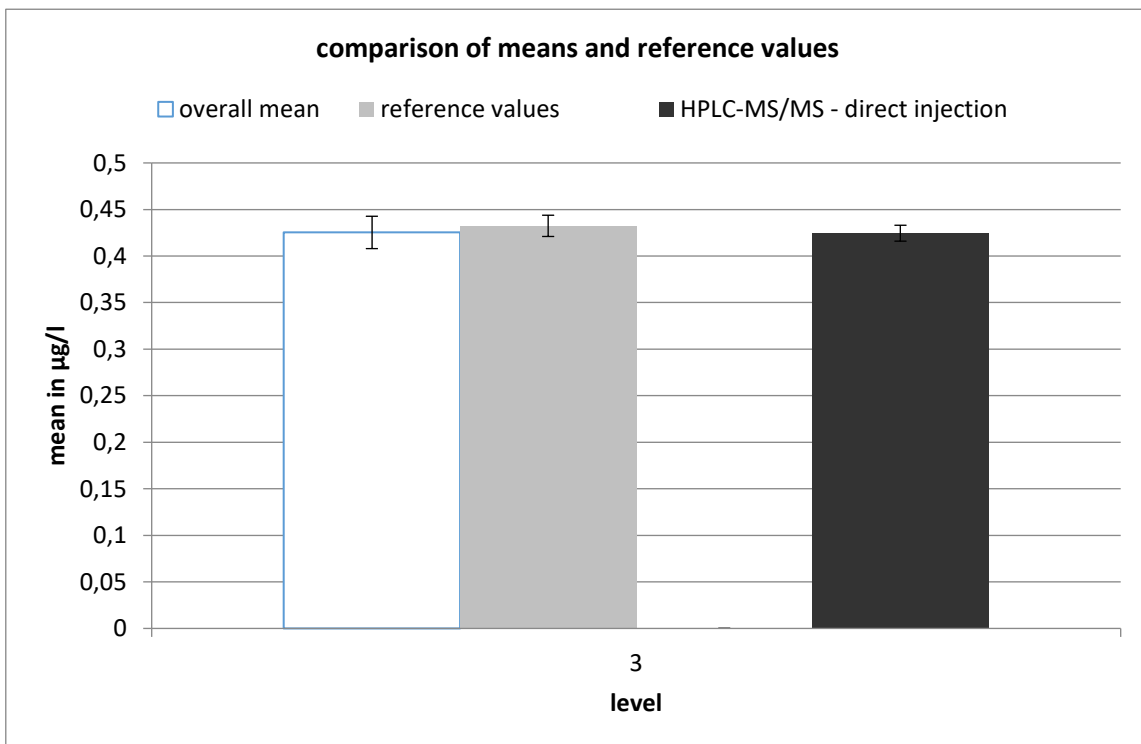
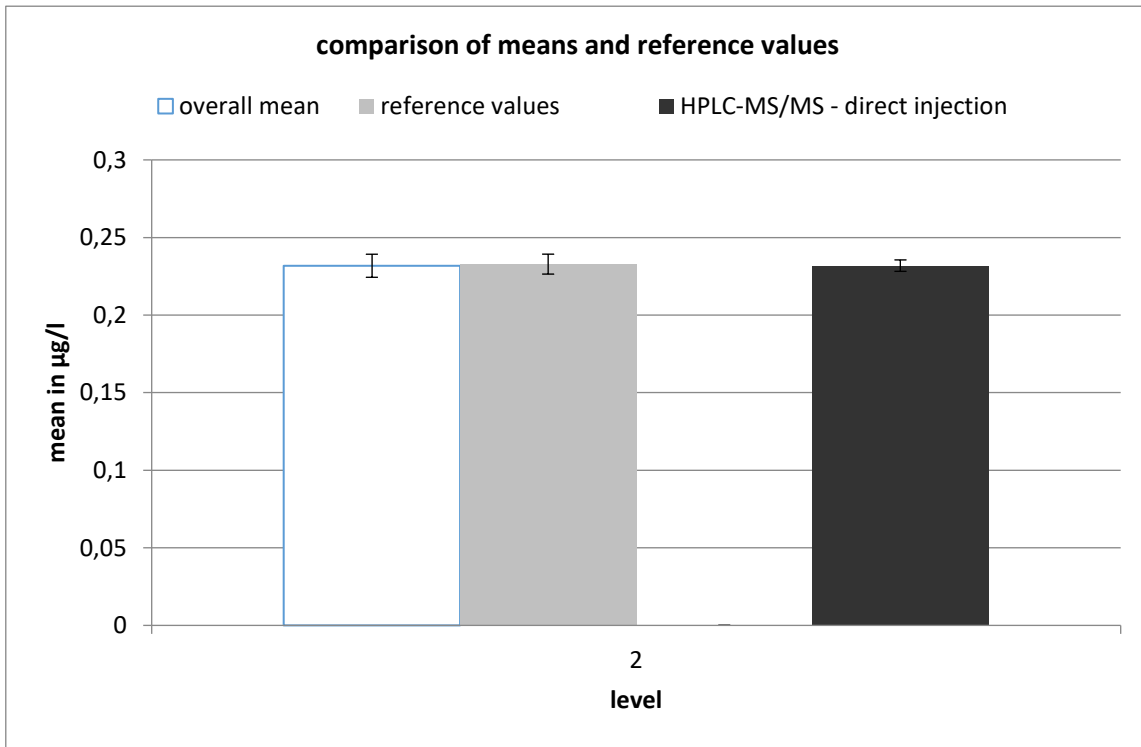


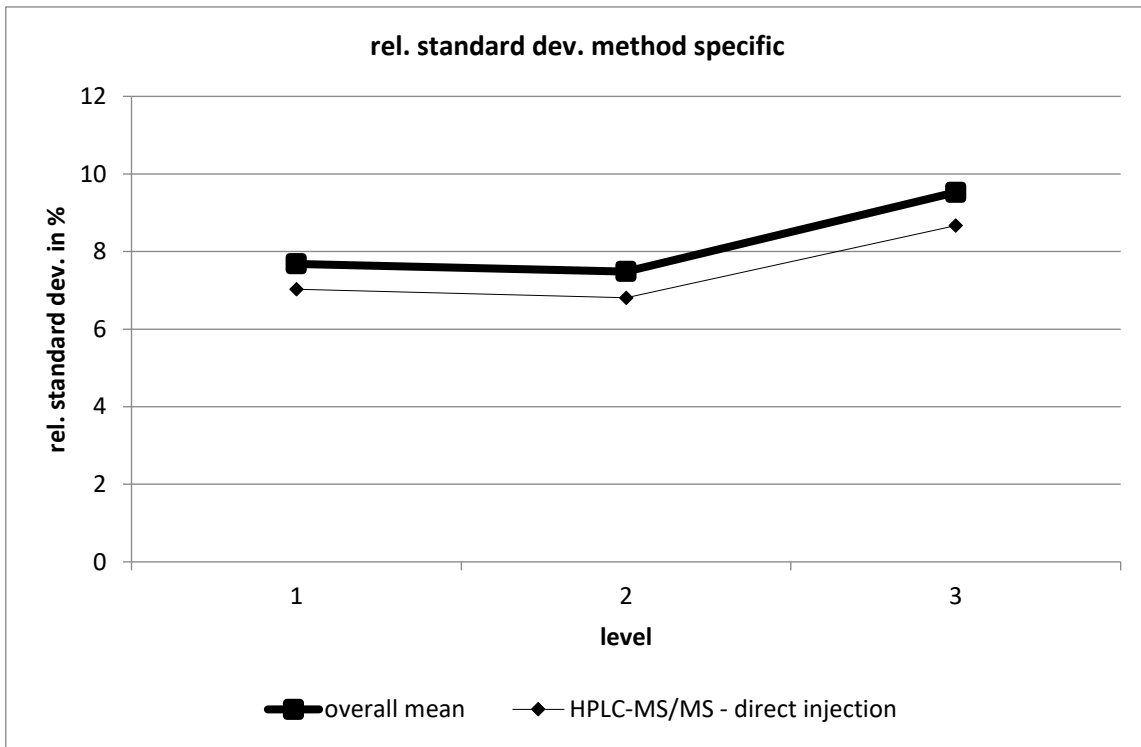
Given the small number of participants, no significant differences.

**Comparison of means and reference values**

level	Experimental Data			Reference Data		
	mean [ $\mu\text{g/l}$ ]	exp. uncertainty [ $\mu\text{g/l}$ ]	exp. uncertainty [%]	reference value [ $\mu\text{g/l}$ ]	exp. uncertainty [ $\mu\text{g/l}$ ]	exp. uncertainty [%]
1	0,0904	0,0030	3,3	0,0931	0,0033	3,5
2	0,2318	0,0074	3,2	0,2328	0,0064	2,8
3	0,4253	0,0174	4,1	0,4324	0,0114	2,6





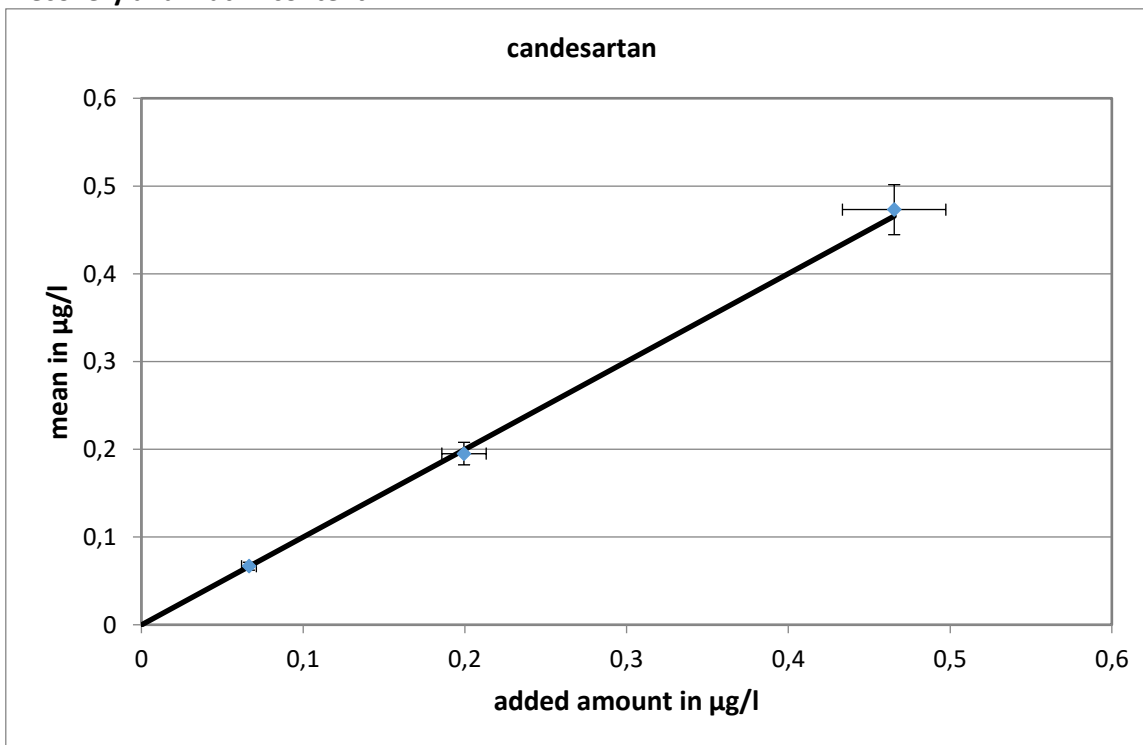


HPLC-MS/MS - direct injection									
level	robust mean [µg/l]	exp. unc. of the mean [µg/l]	exp. unc. of the mean [%]	robust standard deviation [µg/l]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,091	0,001	1,632	0,006	7,03	29	2	2	13,79
2	0,232	0,004	1,58	0,016	6,809	29	1	1	6,897
3	0,425	0,009	2,012	0,037	8,67	29	2	1	10,34

# candesartan

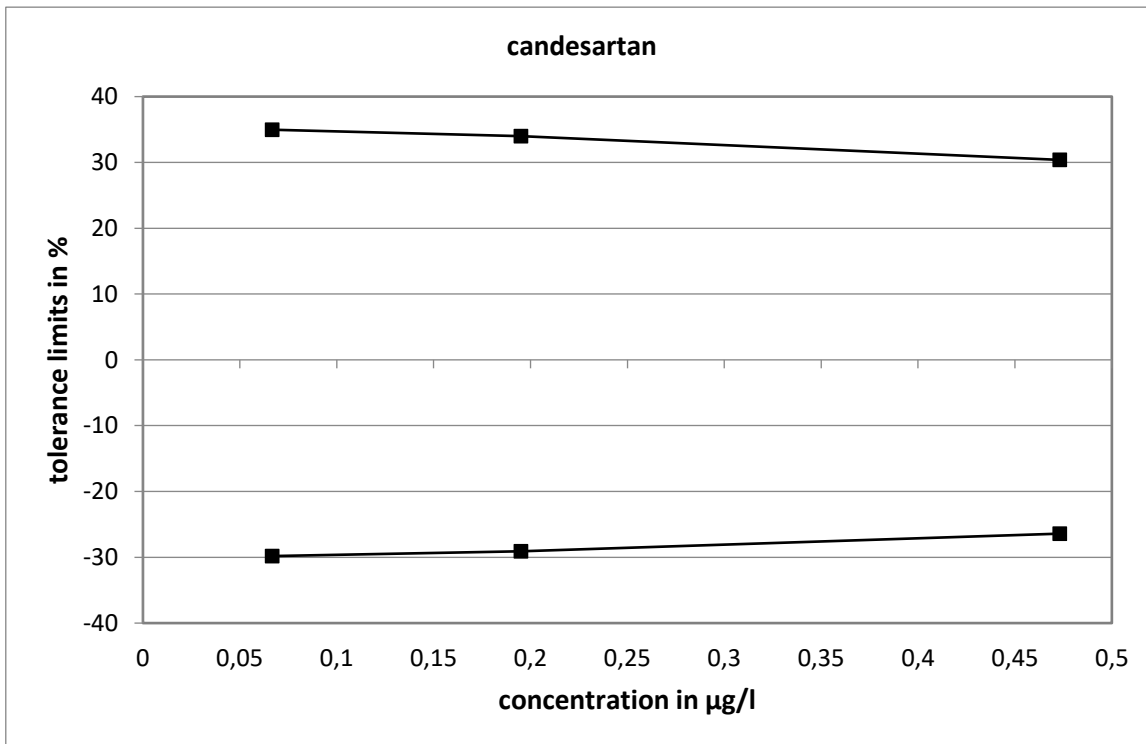
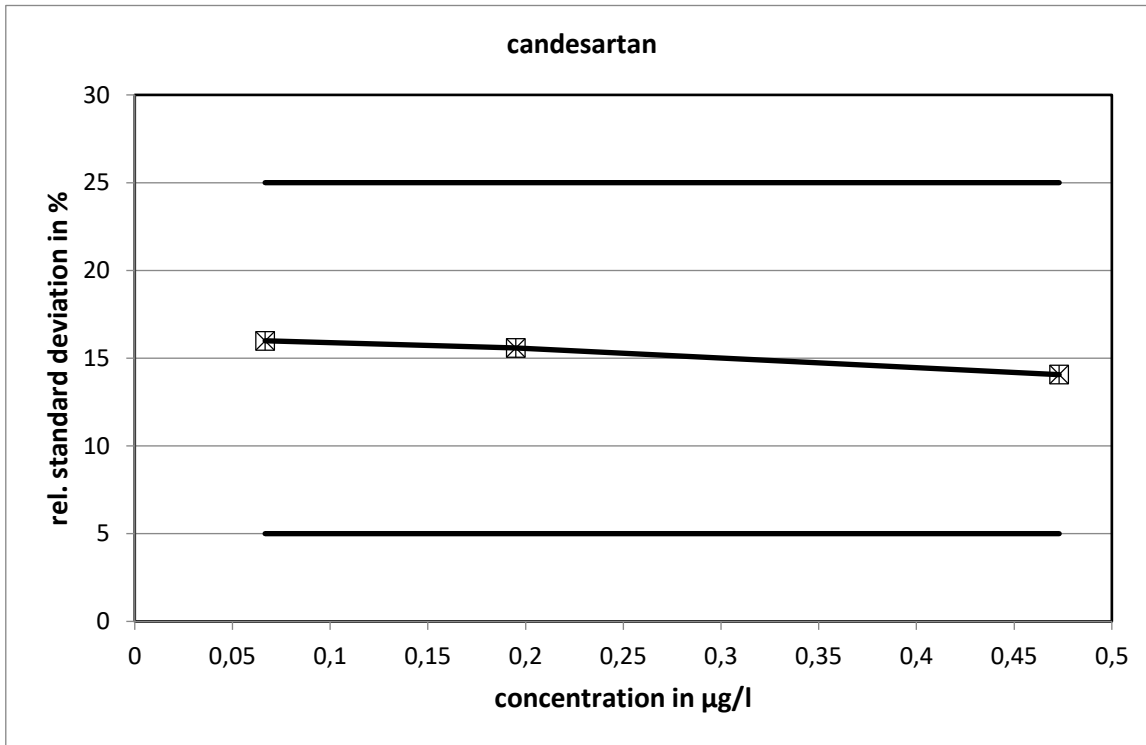
level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,0667	6,76	0,0107	0,0107	15,99	0,0900	0,0468	34,97	-29,81	35	1	4	14,3
2	0,1951	6,58	0,0304	0,0304	15,58	0,2614	0,1383	33,98	-29,09	35	0	2	5,7
3	0,4730	6,03	0,0665	0,0665	14,06	0,6168	0,3481	30,38	-26,41	34	0	2	5,9
sum										104	1	8	8,7

## Recovery and matrix content



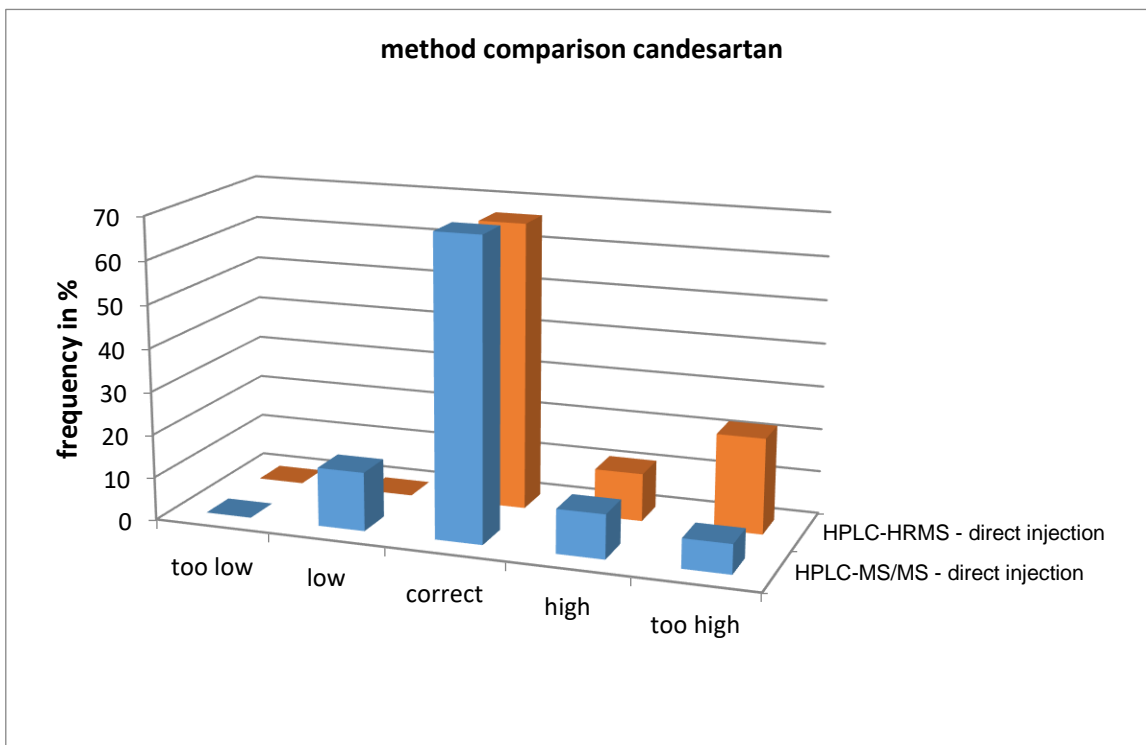
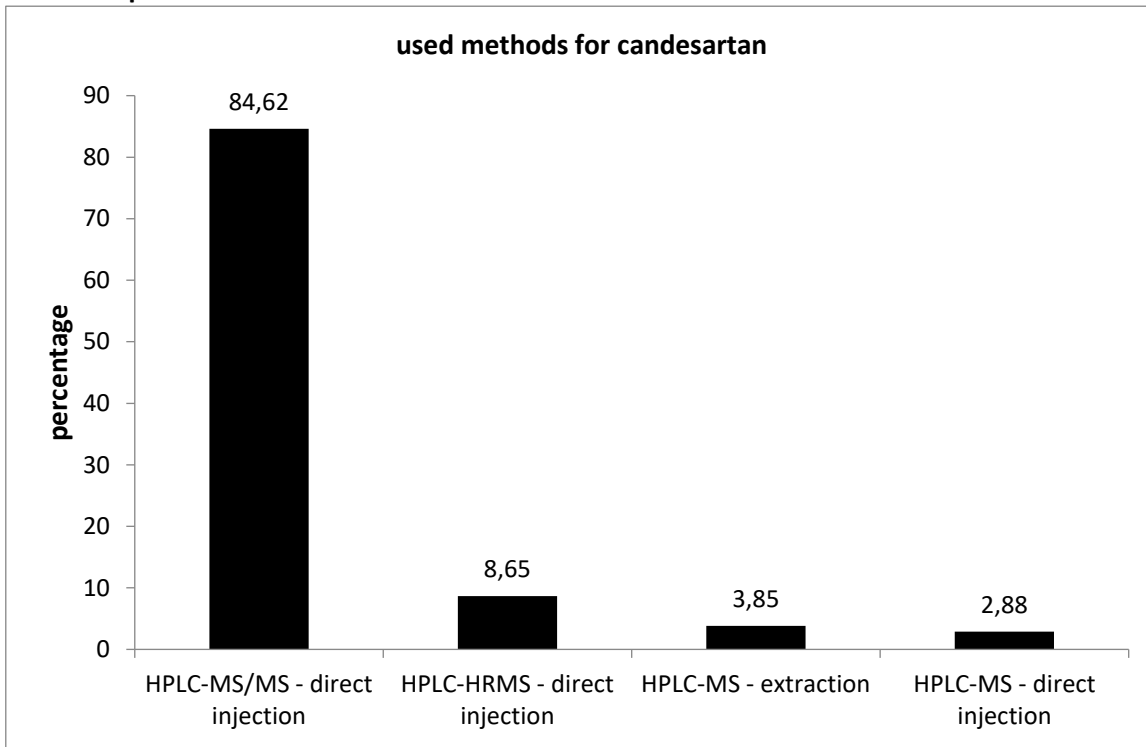
Slope of the regression line: 1,00; average recovery: 100 %  
 no matrix content

Relative standard deviation and tolerance limits





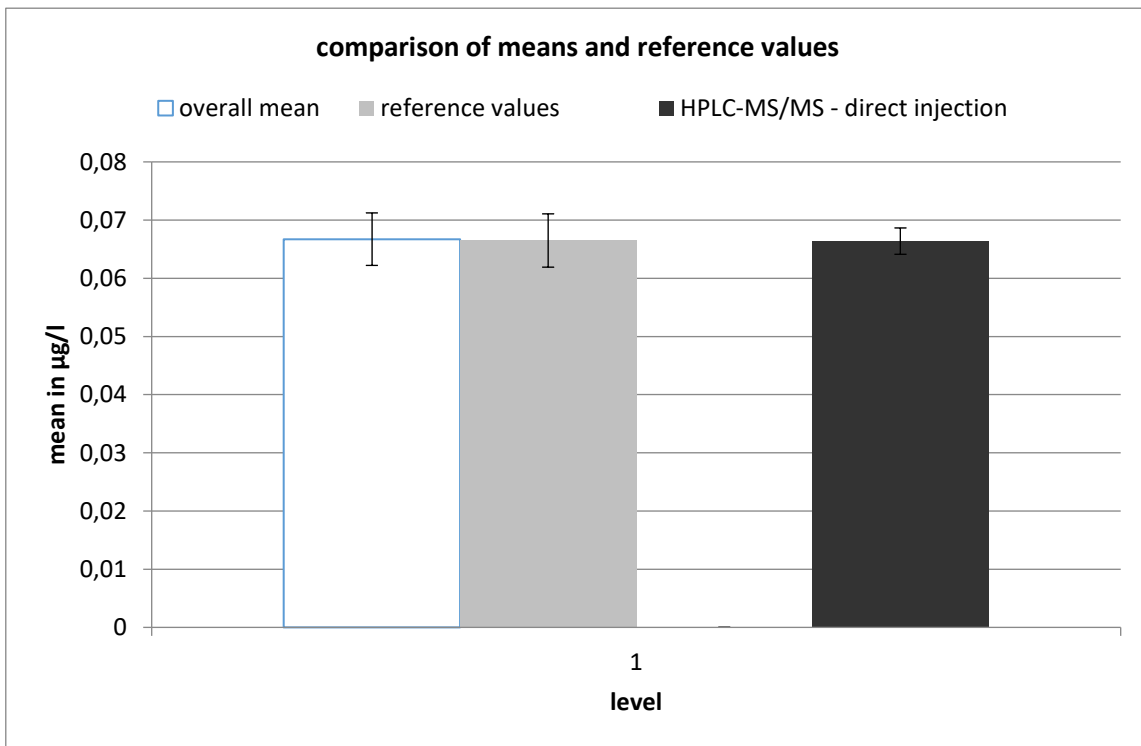
Method specific evaluation

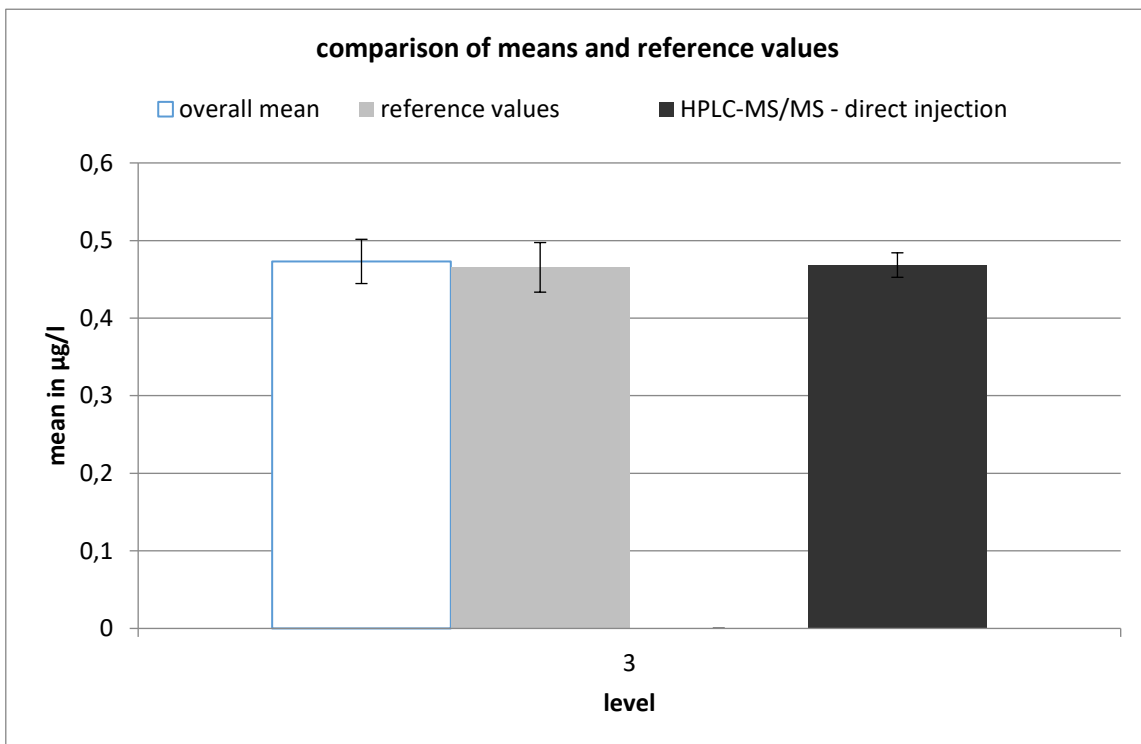
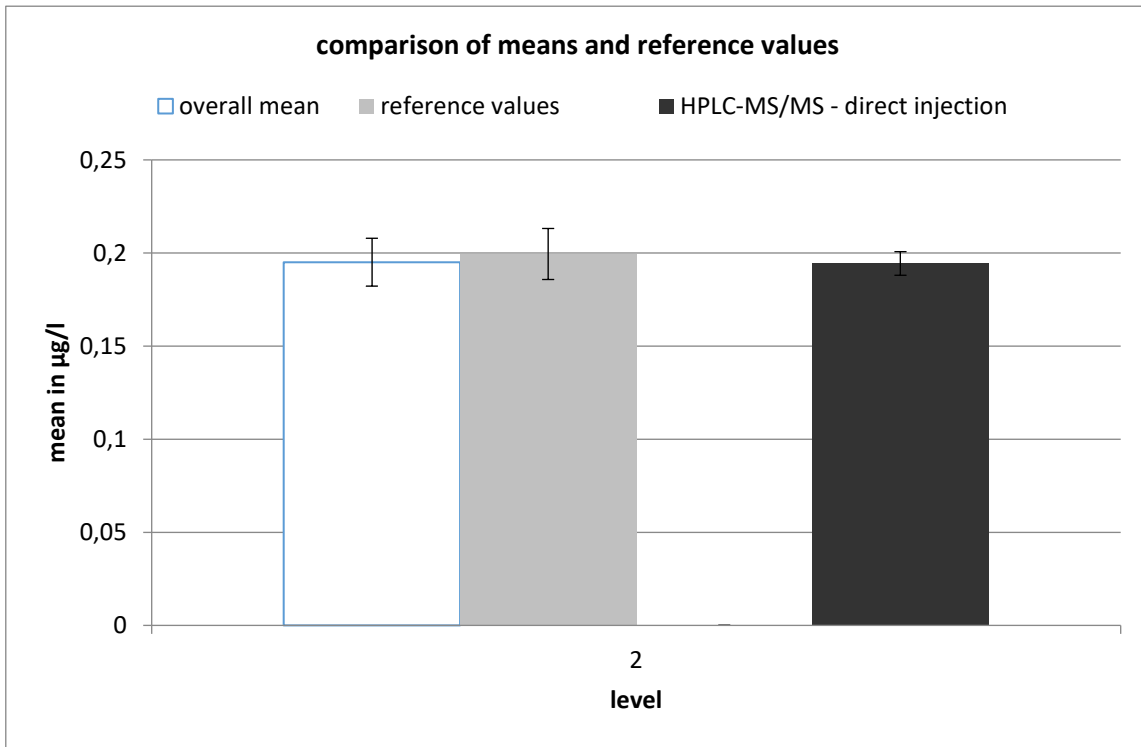


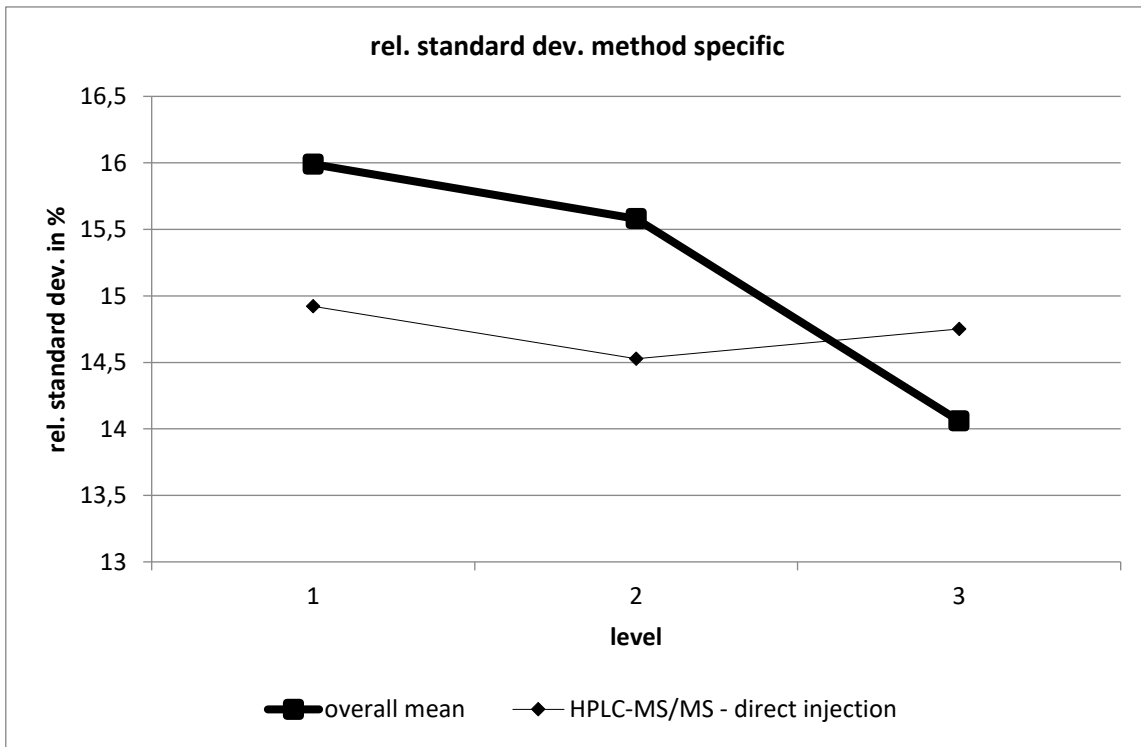
Given the small number of participants, no significant differences.

**Comparison of means and reference values**

level	mean [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]	reference value [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]
1	0,0667	0,0045	6,8	0,0665	0,0046	6,9
2	0,1951	0,0128	6,6	0,1995	0,0137	6,9
3	0,4730	0,0285	6,0	0,4654	0,0320	6,9





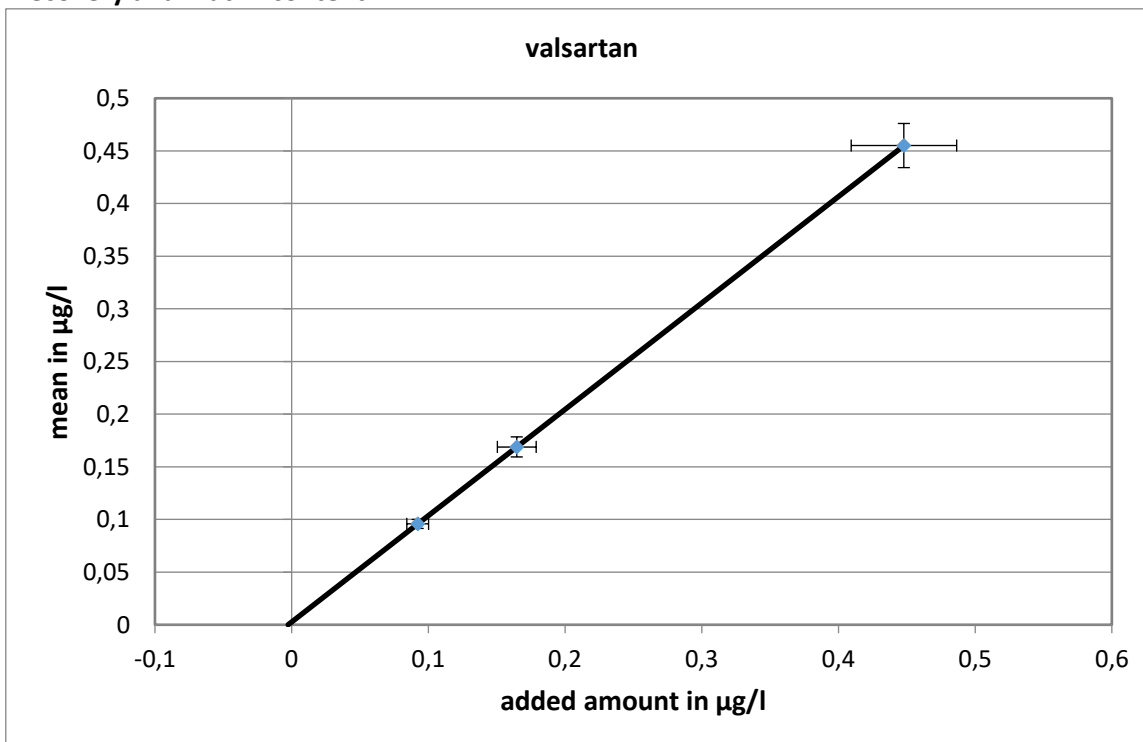


HPLC-MS/MS - direct injection									
level	robust mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [%]	robust standard deviation [ $\mu\text{g/l}$ ]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,066	0,002	3,405	0,01	14,92	30	0	5	16,67
2	0,194	0,006	3,261	0,028	14,53	31	0	3	9,677
3	0,468	0,016	3,367	0,069	14,75	30	1	1	6,667

# valsartan

level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,0958	4,46	0,0101	0,0101	10,56	0,1172	0,0765	22,35	-20,12	35	2	2	11,4
2	0,1689	5,64	0,0225	0,0225	13,34	0,2174	0,1264	28,72	-25,14	35	1	2	8,6
3	0,4551	4,61	0,0496	0,0496	10,90	0,5603	0,3607	23,12	-20,73	35	1	2	8,6
sum										105	4	6	9,5

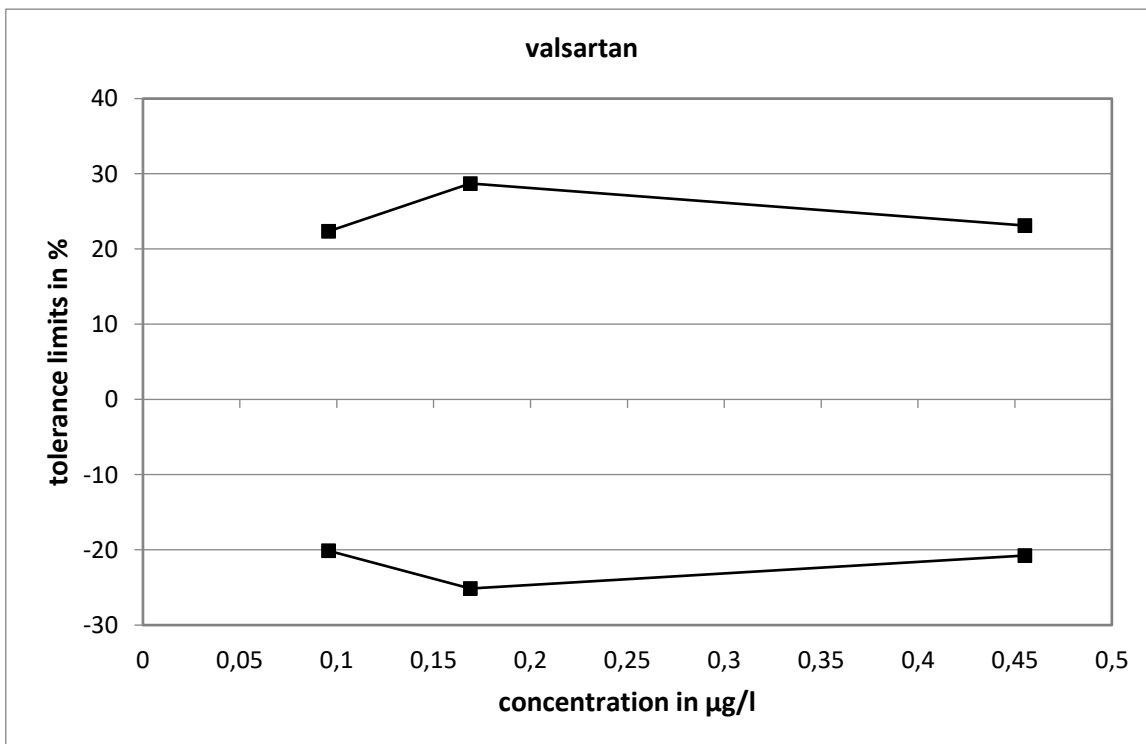
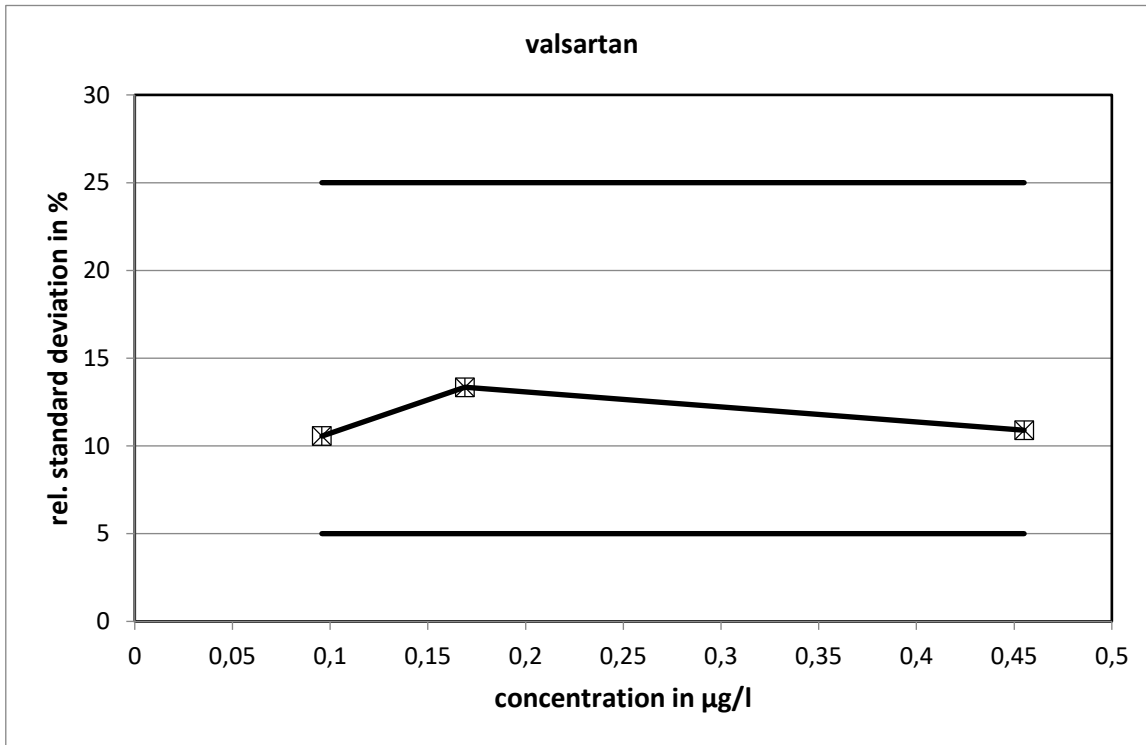
## Recovery and matrix content



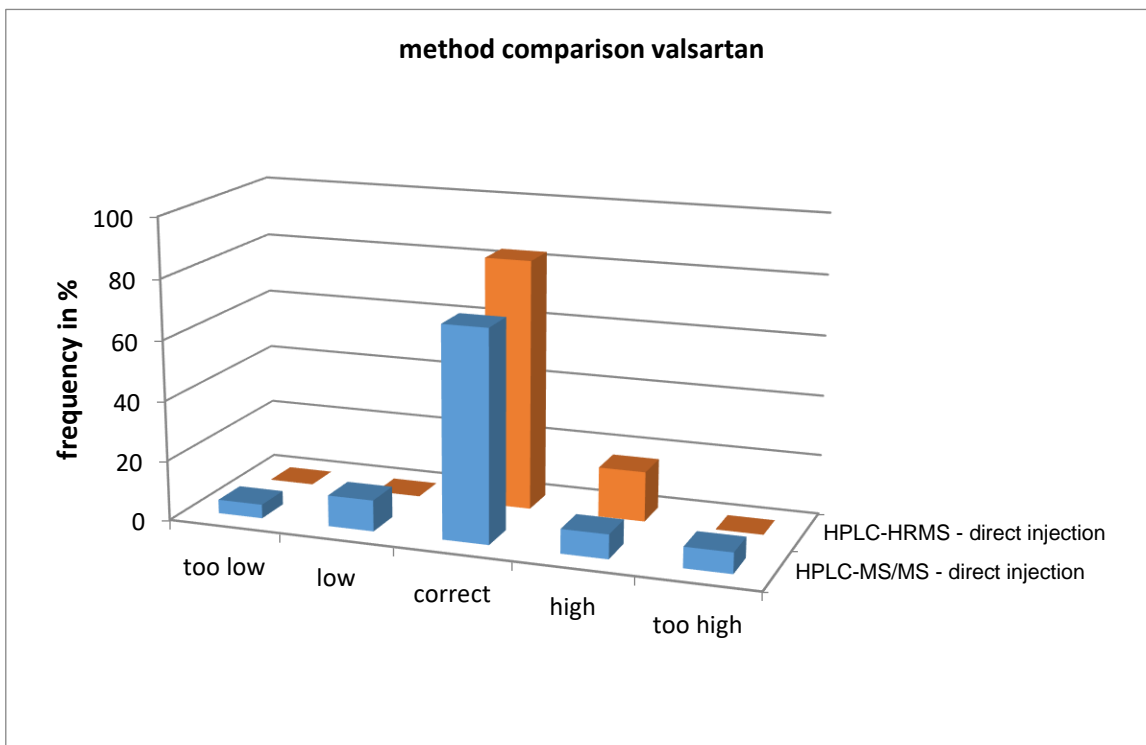
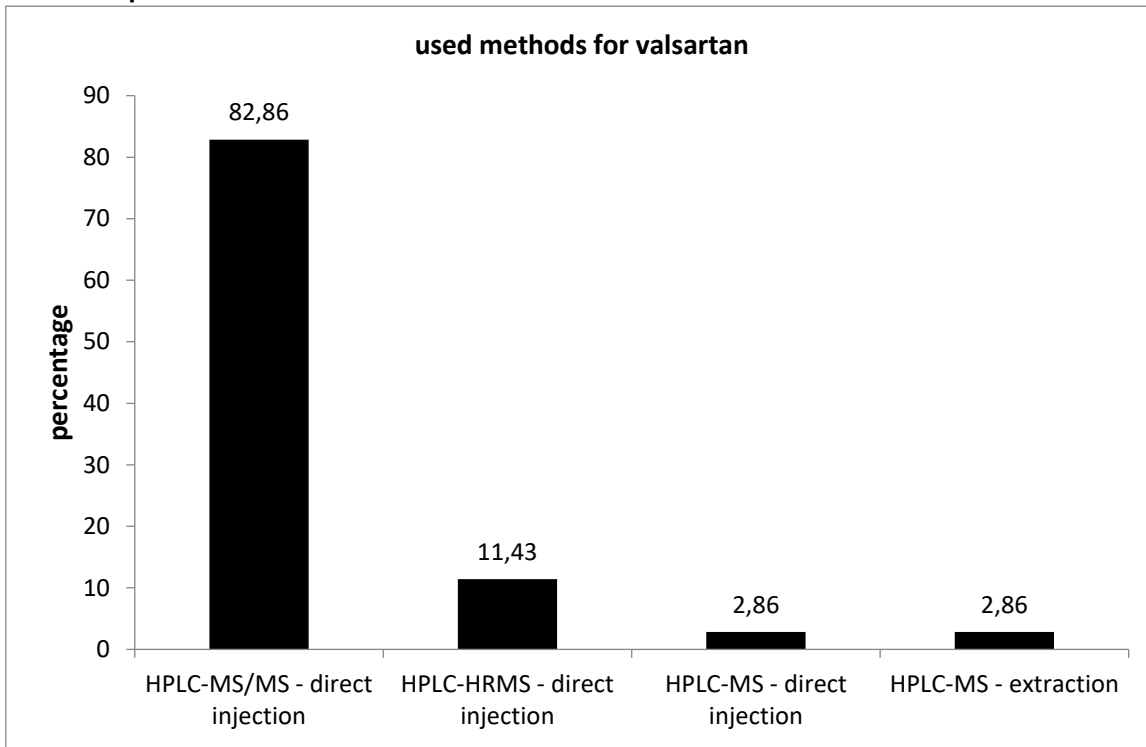
Slope of the regression line: 1,01; average recovery: 101 %

calculated matrix content: 0,003 µg/l, uncertainty of the matrix content: 100%

Relative standard deviation and tolerance limits



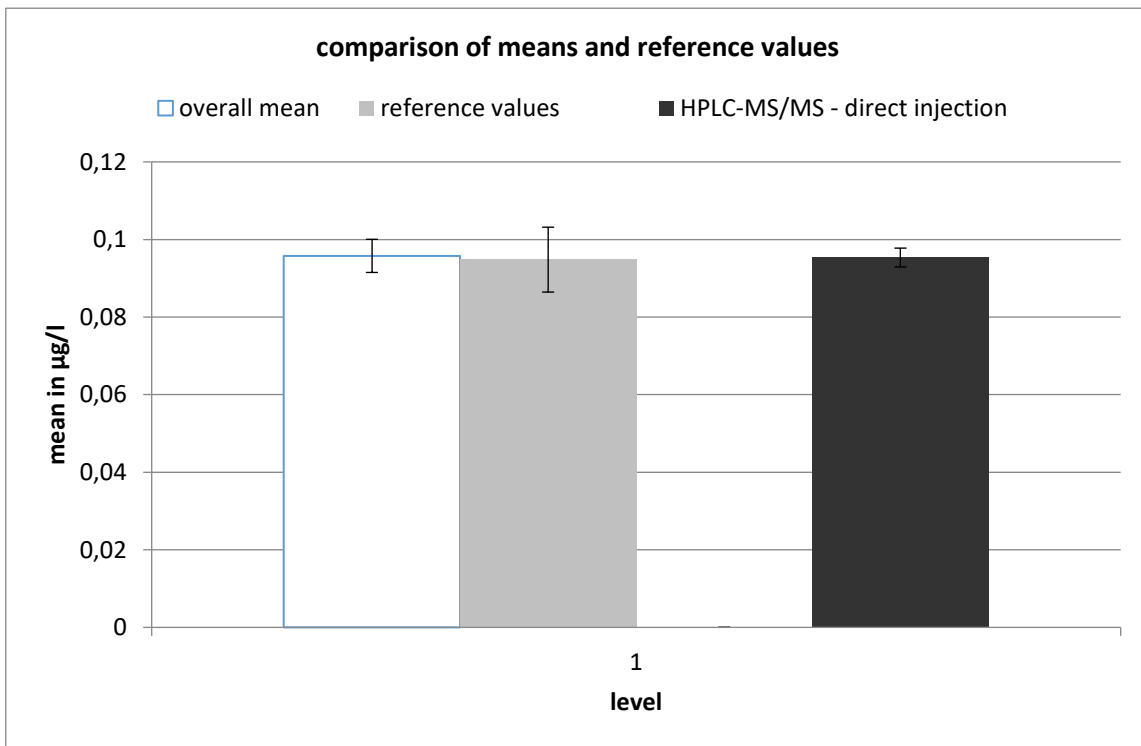
Method specific evaluation



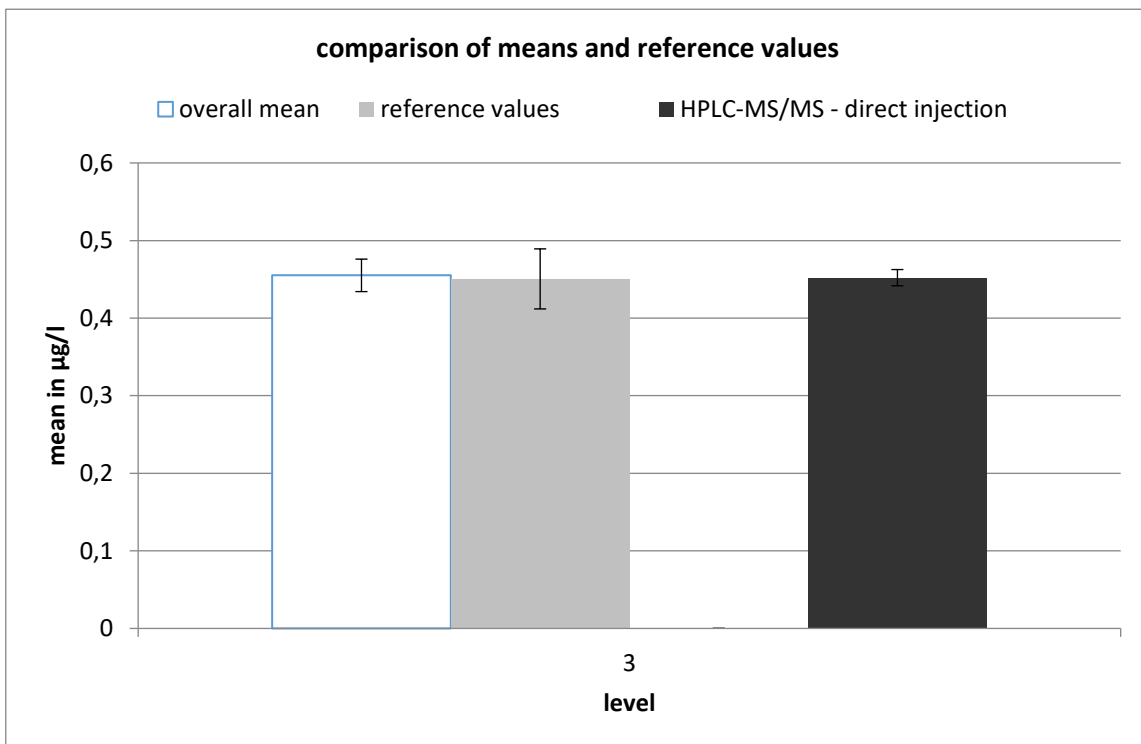
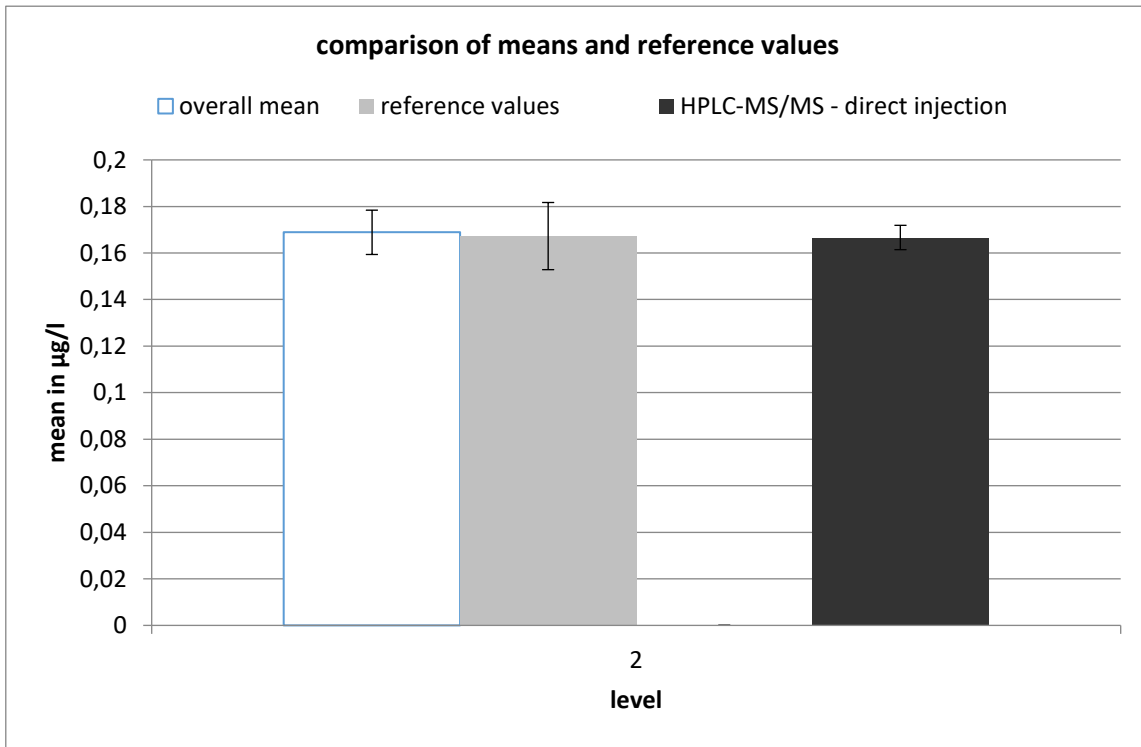
Given the small number of participants, no significant differences.

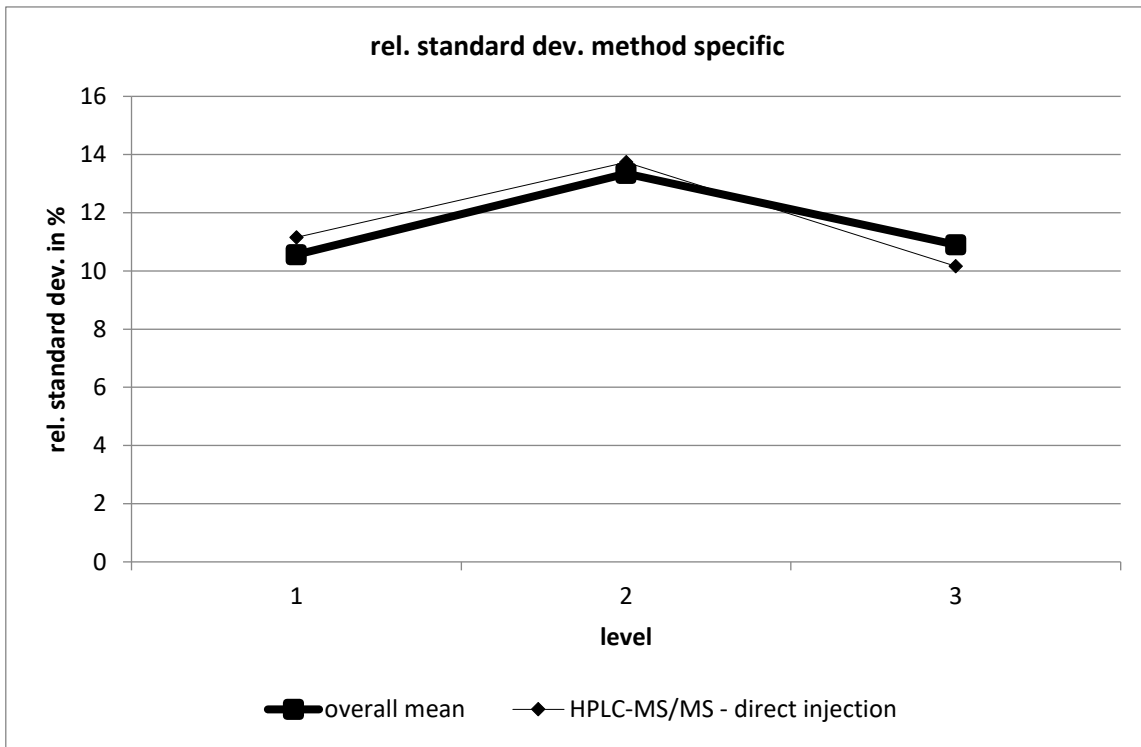
**Comparison of means and reference values**

level	mean [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]	reference value [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]
1	0,0958	0,0043	4,5	0,0948	0,0084	8,8
2	0,1689	0,0095	5,6	0,1673	0,0144	8,6
3	0,4551	0,0210	4,6	0,4505	0,0387	8,6







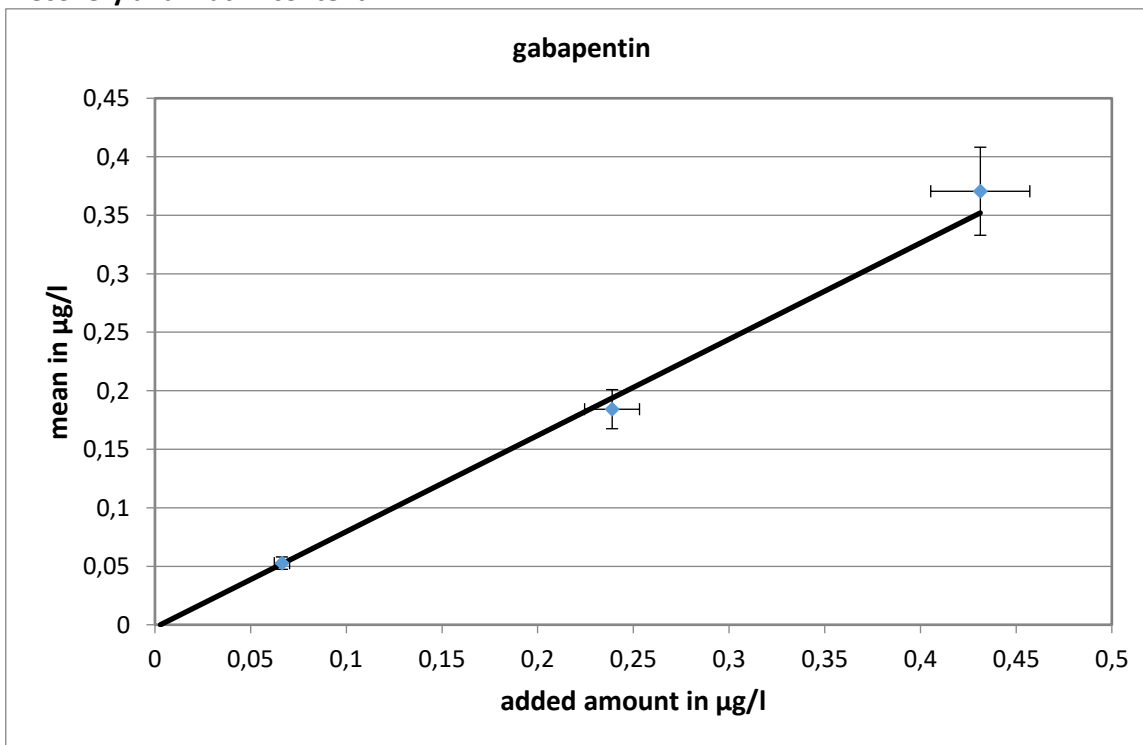


HPLC-MS/MS - direct injection									
level	robust mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [%]	robust standard deviation [ $\mu\text{g/l}$ ]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,095	0,002	2,546	0,011	11,16	30	2	3	16,67
2	0,167	0,005	3,135	0,023	13,74	30	1	2	10
3	0,452	0,01	2,319	0,046	10,16	30	2	2	13,33

# gabapentin

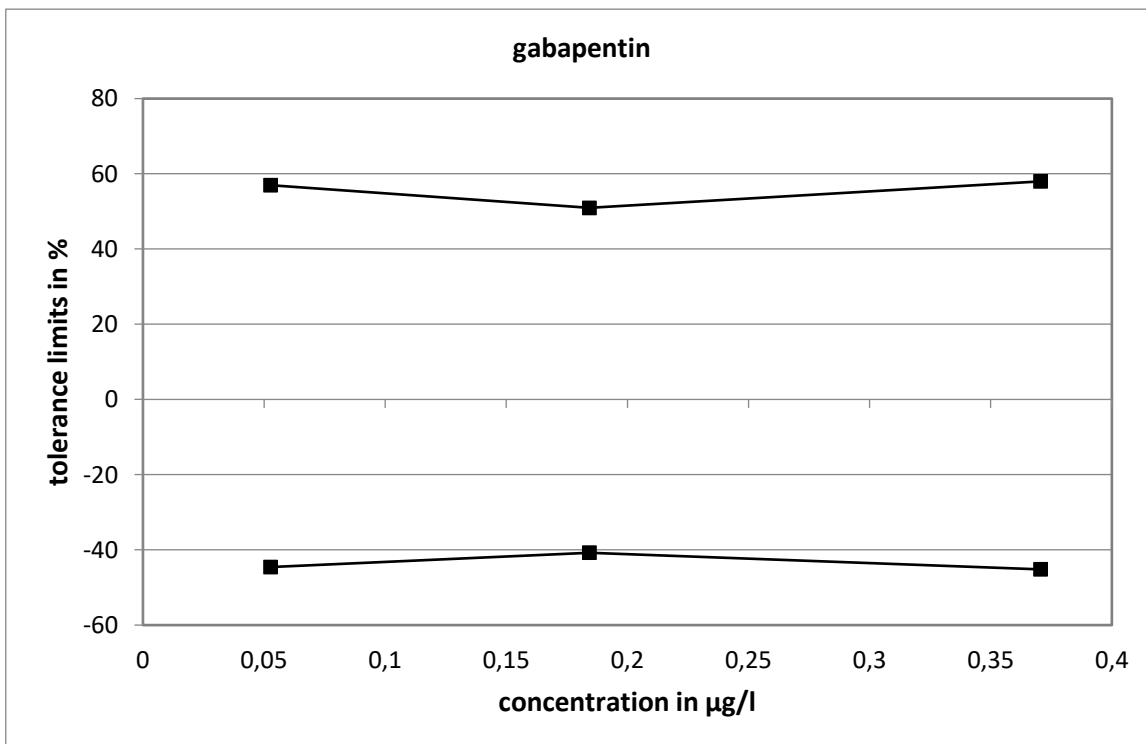
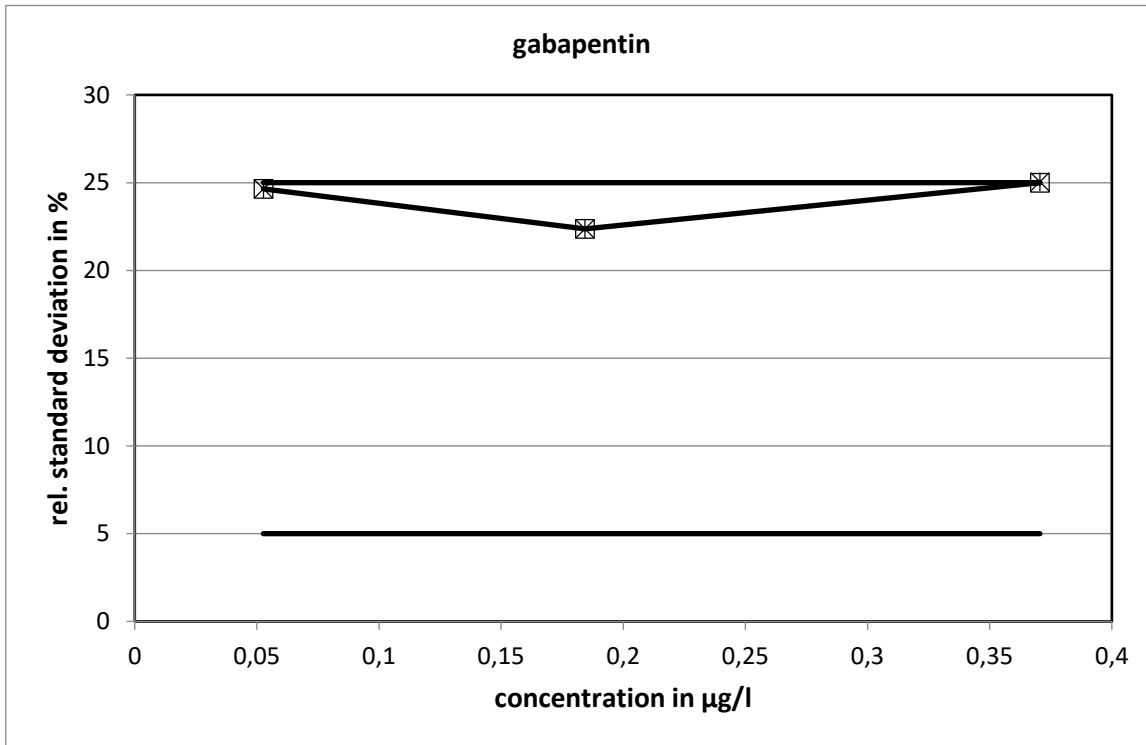
level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,0527	9,99	0,0130	0,0130	24,64	0,0827	0,0292	57,00	-44,58	38	0	4	10,5
2	0,1843	9,07	0,0412	0,0412	22,37	0,2782	0,1091	50,96	-40,77	38	0	5	13,2
3	0,3706	10,16	0,0928	0,0926	25,00	0,5854	0,2031	57,99	-45,19	38	0	3	7,9
sum										114	0	12	10,5

## Recovery and matrix content

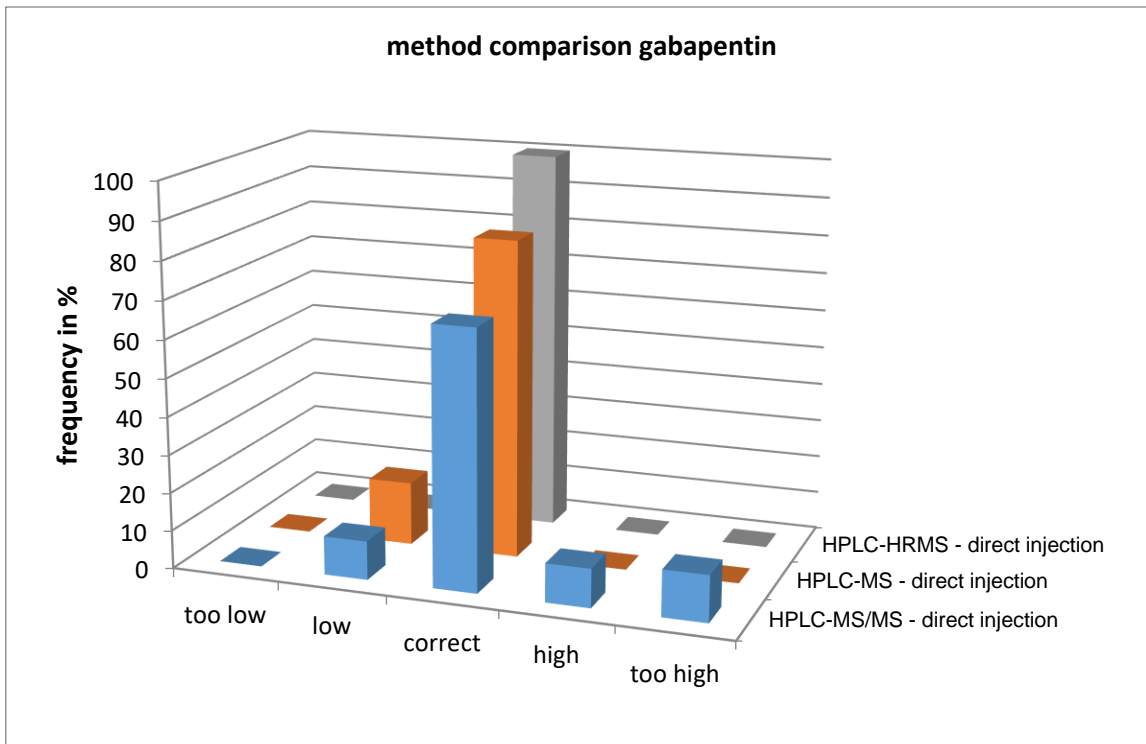
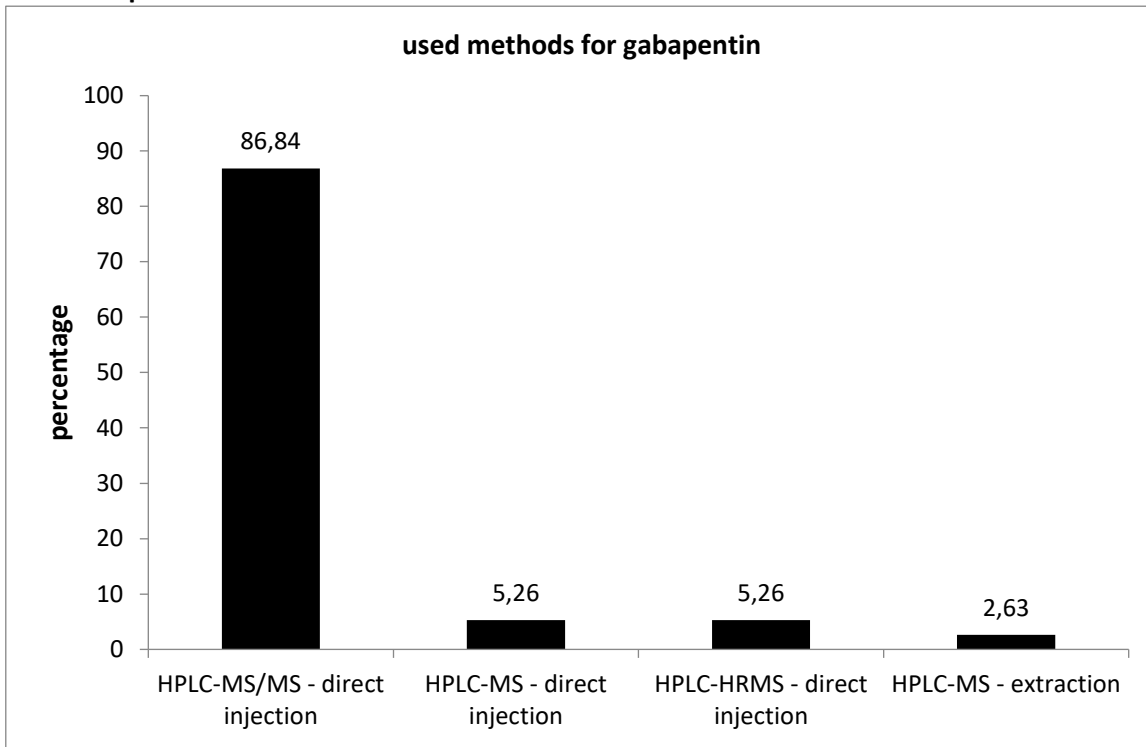


Slope of the regression line: 0,82; average recovery: 82 %  
no matrix content

Relative standard deviation and tolerance limits



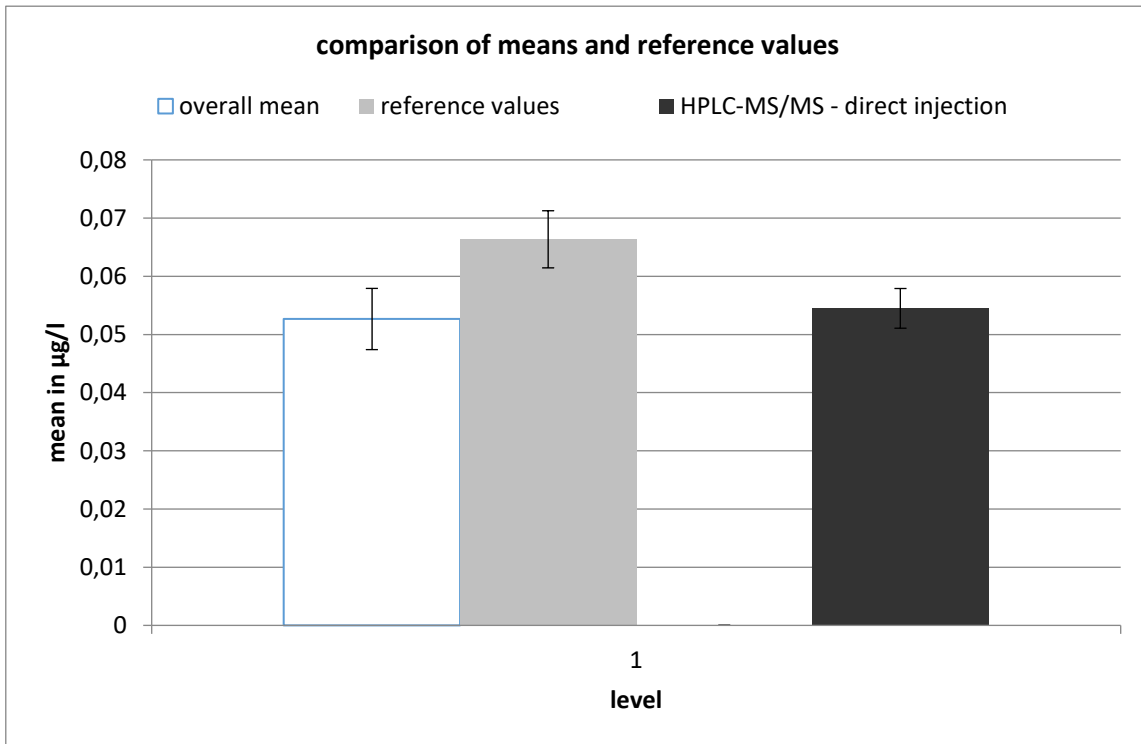
Method specific evaluation

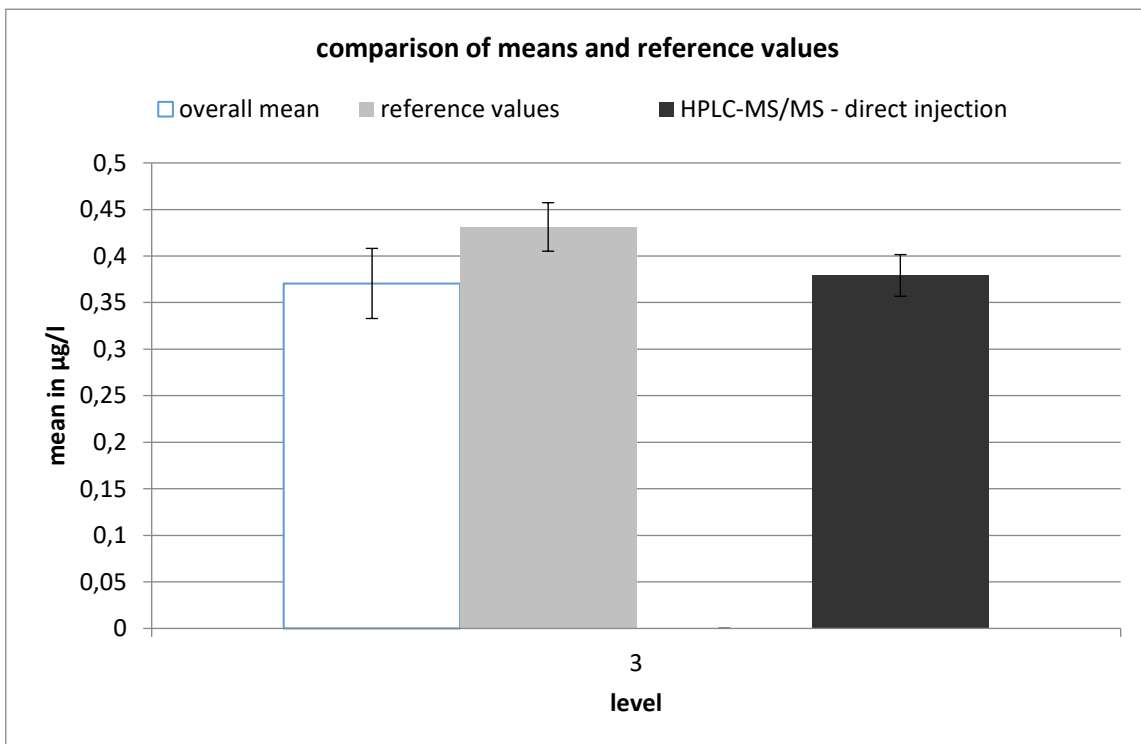
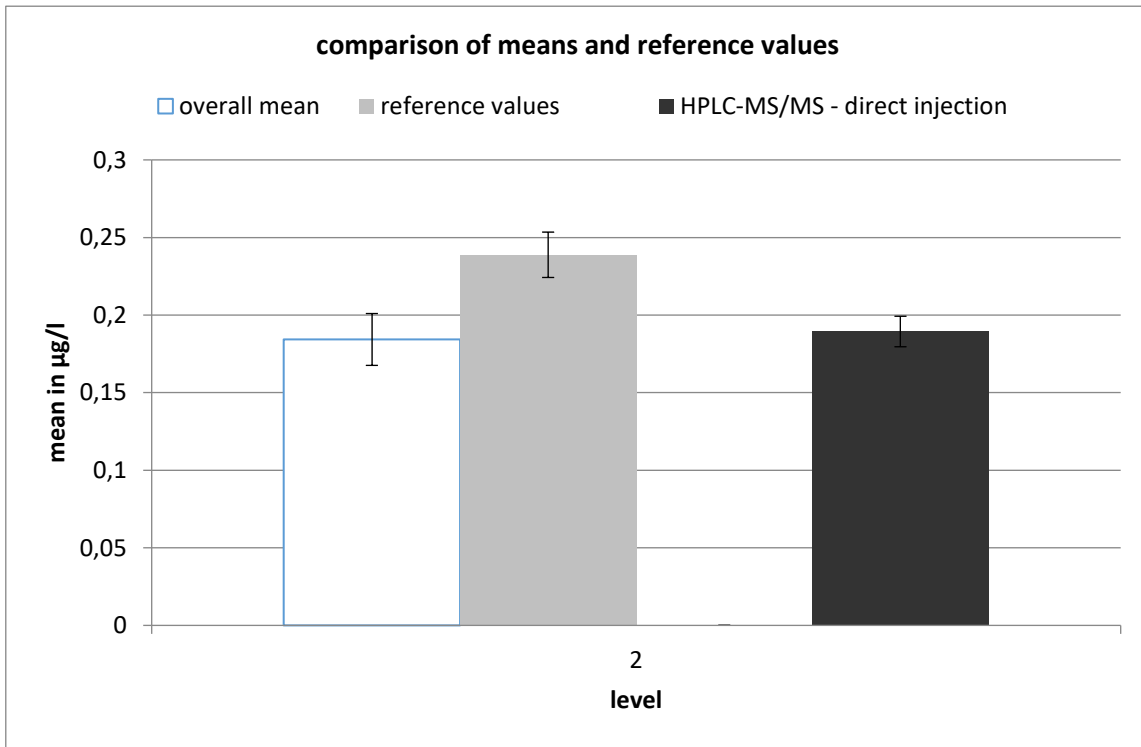


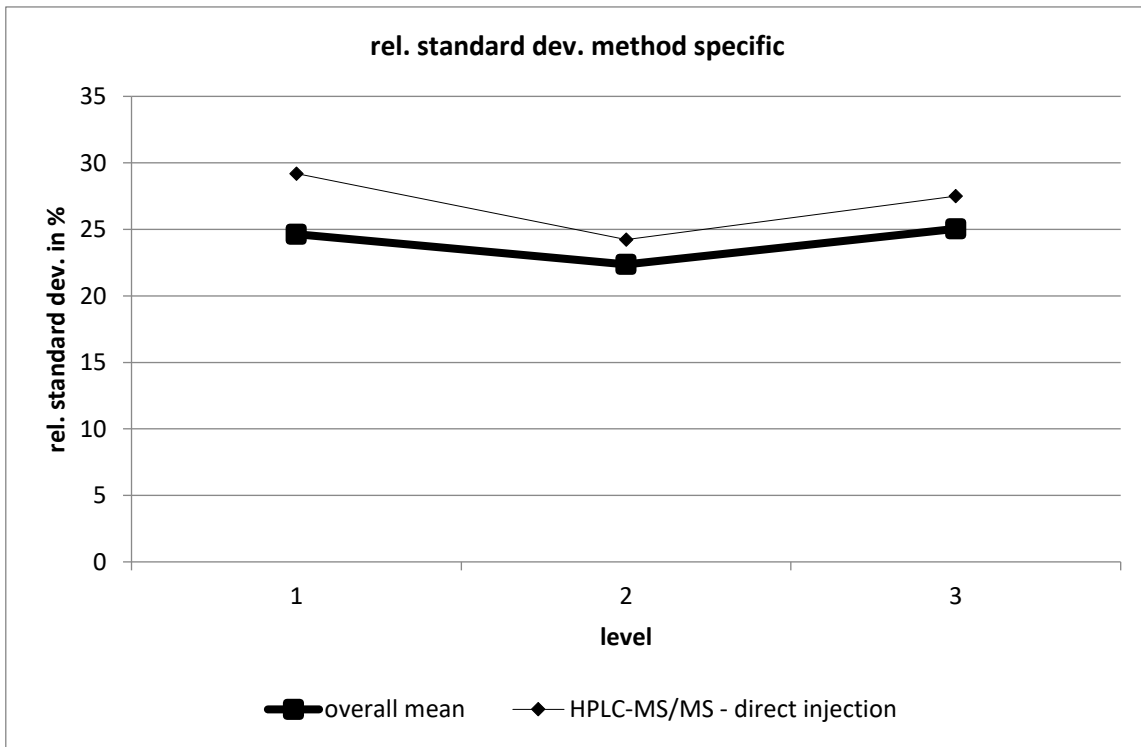
Given the small number of participants, no significant differences.

**Comparison of means and reference values**

level	mean [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]	reference value [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]
1	0,0527	0,0053	10,0	0,0663	0,0049	7,4
2	0,1843	0,0167	9,1	0,2388	0,0146	6,1
3	0,3706	0,0376	10,2	0,4313	0,0261	6,0







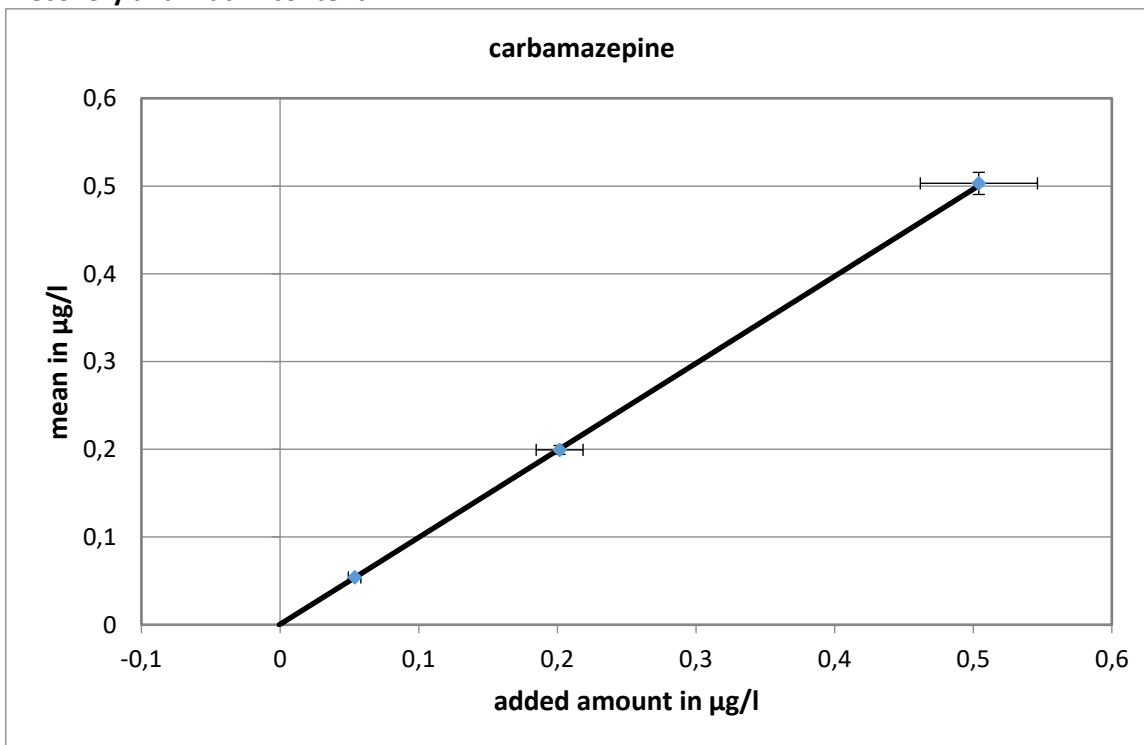
HPLC-MS/MS - direct injection									
level	robust mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [%]	robust standard deviation [ $\mu\text{g/l}$ ]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,054	0,003	6,259	0,016	29,2	34	1	2	8,824
2	0,189	0,01	5,195	0,046	24,23	34	1	3	11,76
3	0,379	0,022	5,897	0,104	27,51	34	1	3	11,76



# carbamazepine

level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,0539	3,68	0,0051	0,0051	9,42	0,0646	0,0442	19,82	-18,04	41	1	2	7,3
2	0,1992	2,54	0,0128	0,0128	6,42	0,2257	0,1744	13,29	-12,46	40	2	3	12,5
3	0,5030	2,51	0,0323	0,0323	6,43	0,5698	0,4403	13,29	-12,47	41	2	1	7,3
sum										122	5	6	9,0

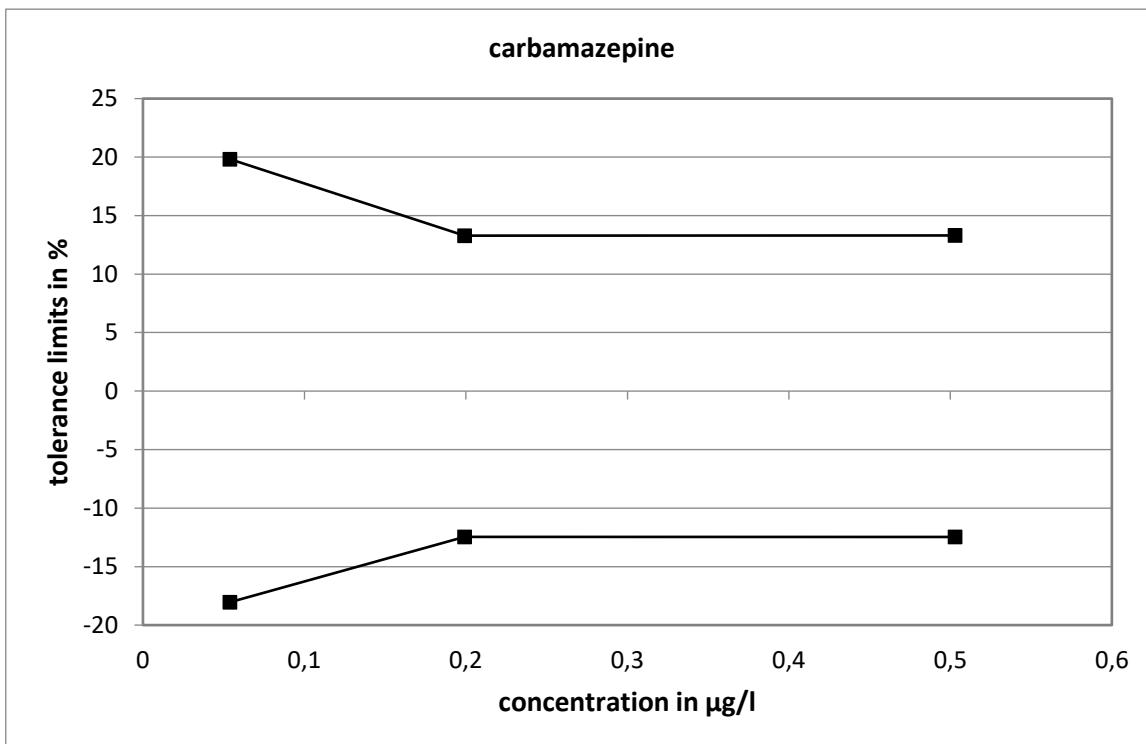
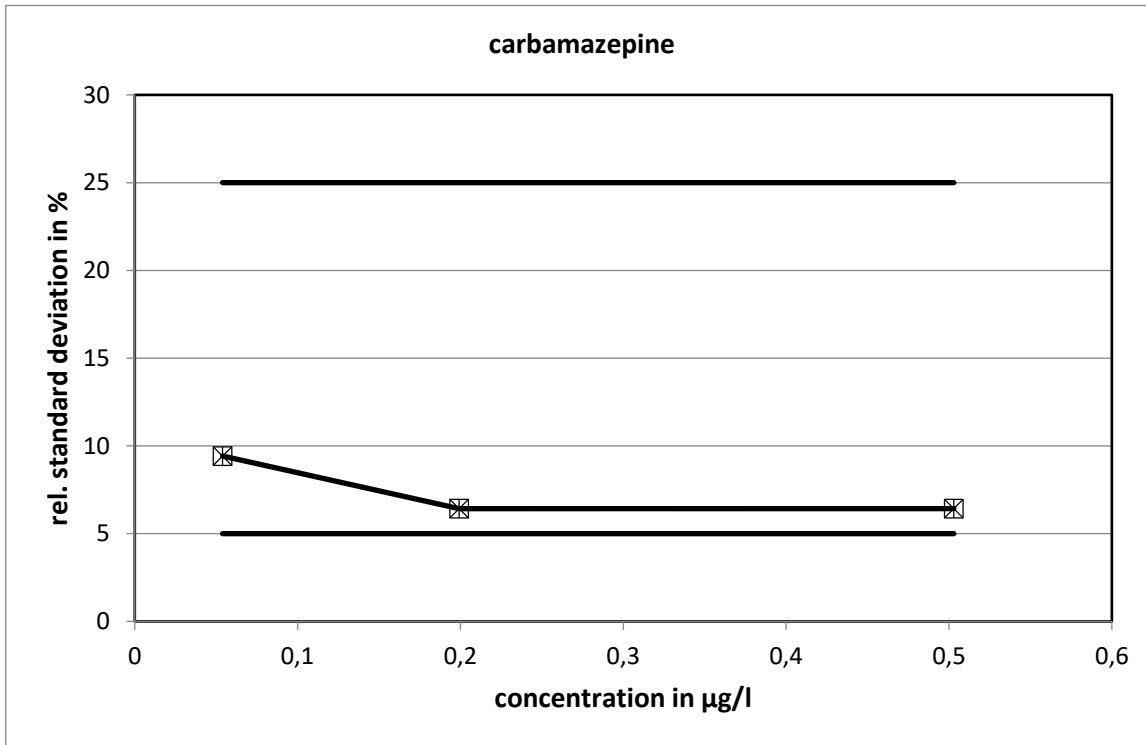
## Recovery and matrix content



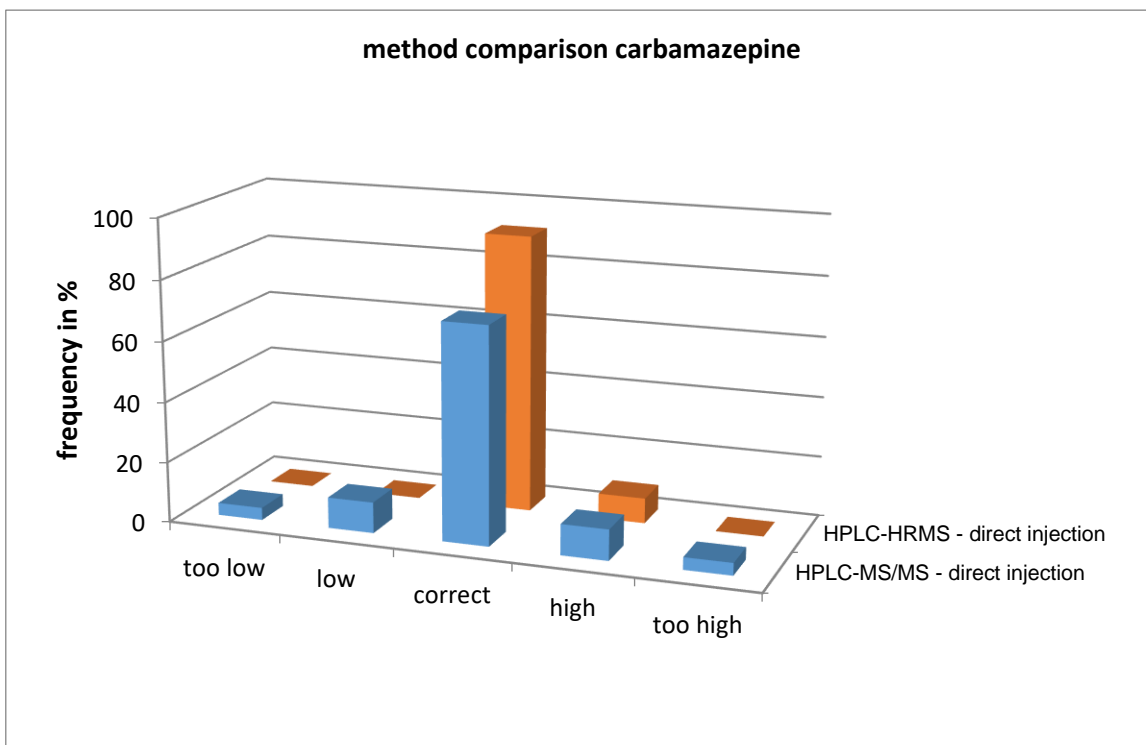
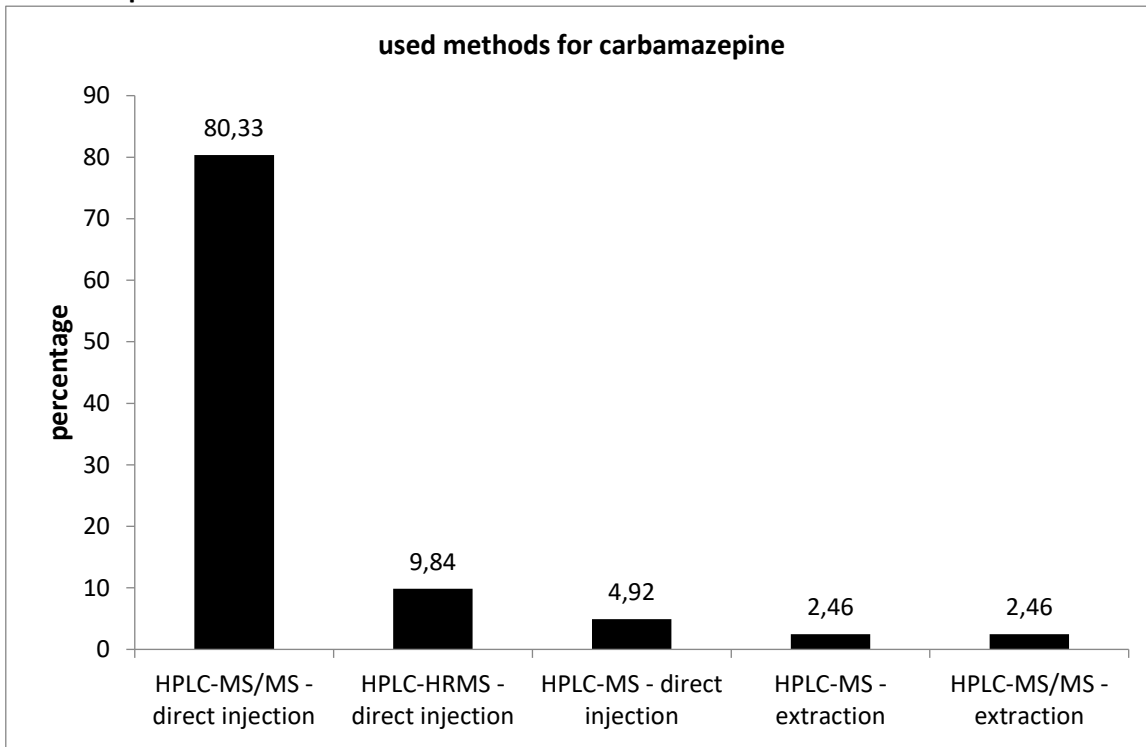
Slope of the regression line: 0,99; average recovery: 99 %

calculated matrix content: 0,00053 µg/l, uncertainty of the matrix content: 100%

Relative standard deviation and tolerance limits



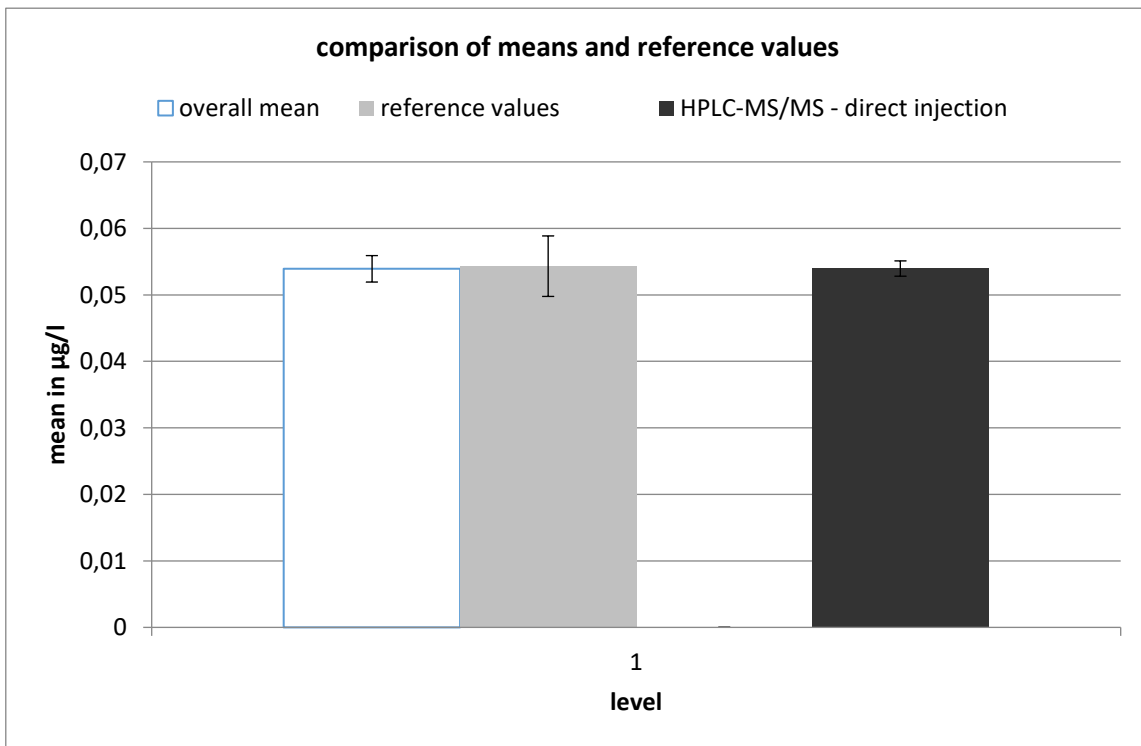
Method specific evaluation

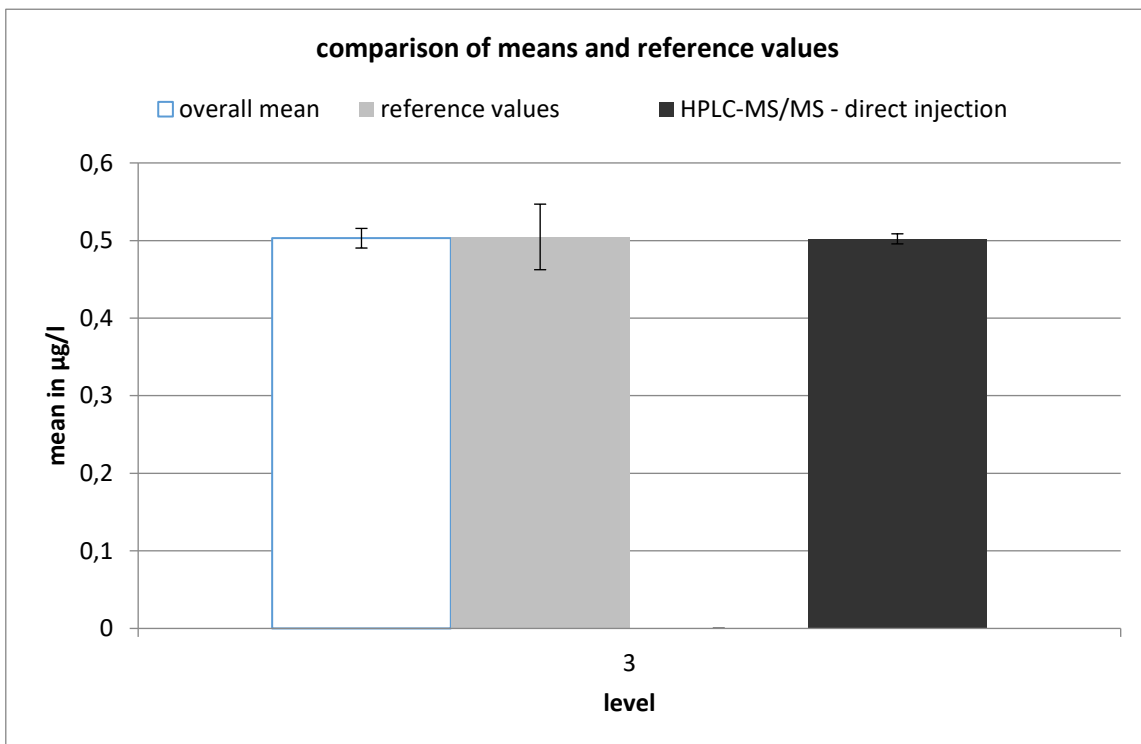
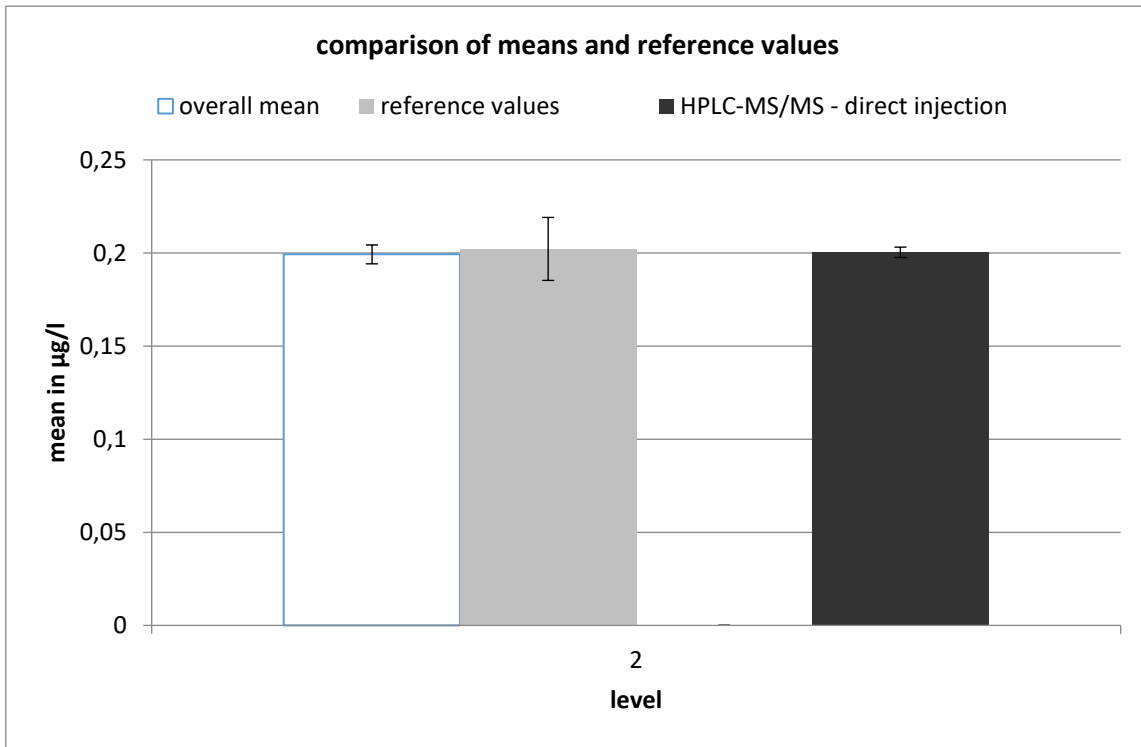


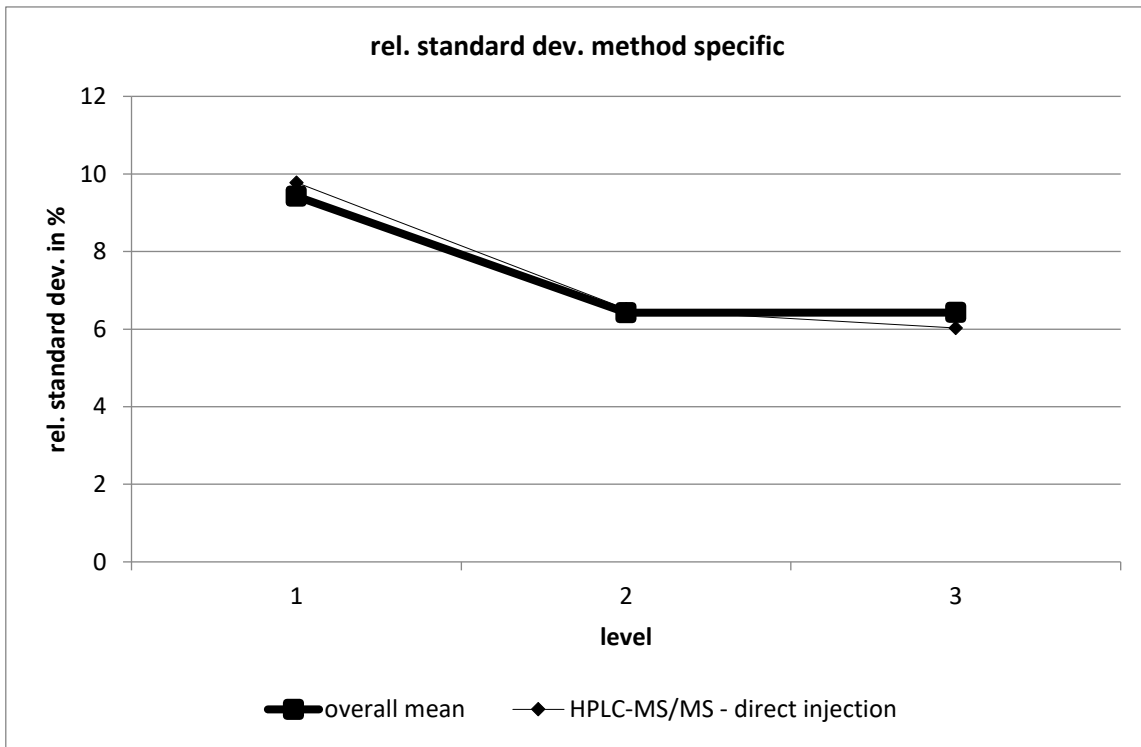
Given the small number of participants, no significant differences.

**Comparison of means and reference values**

level	mean [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]	reference value [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]
1	0,0539	0,0020	3,7	0,0543	0,0045	8,4
2	0,1992	0,0051	2,5	0,2022	0,0169	8,4
3	0,5030	0,0126	2,5	0,5046	0,0423	8,4





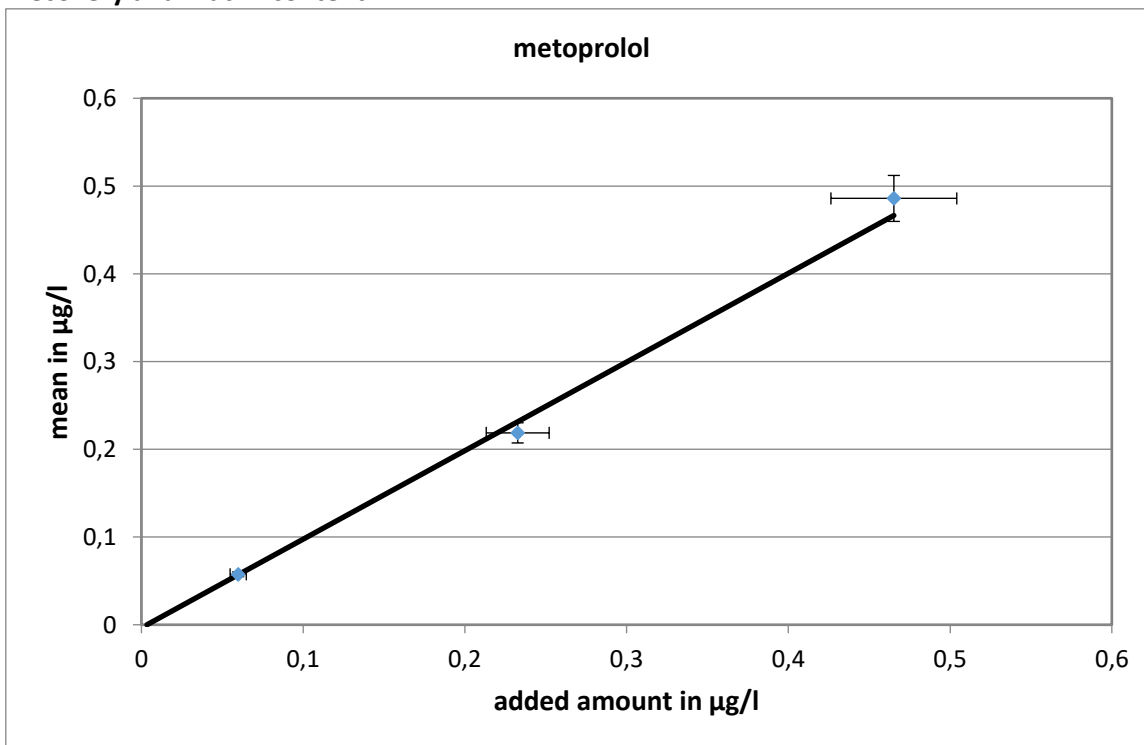


HPLC-MS/MS - direct injection									
level	robust mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [%]	robust standard deviation [ $\mu\text{g/l}$ ]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,054	0,001	2,128	0,005	9,78	33	1	3	12,12
2	0,2	0,003	1,397	0,013	6,515	34	3	2	14,71
3	0,502	0,006	1,293	0,03	6,03	34	2	0	5,882

# metoprolol

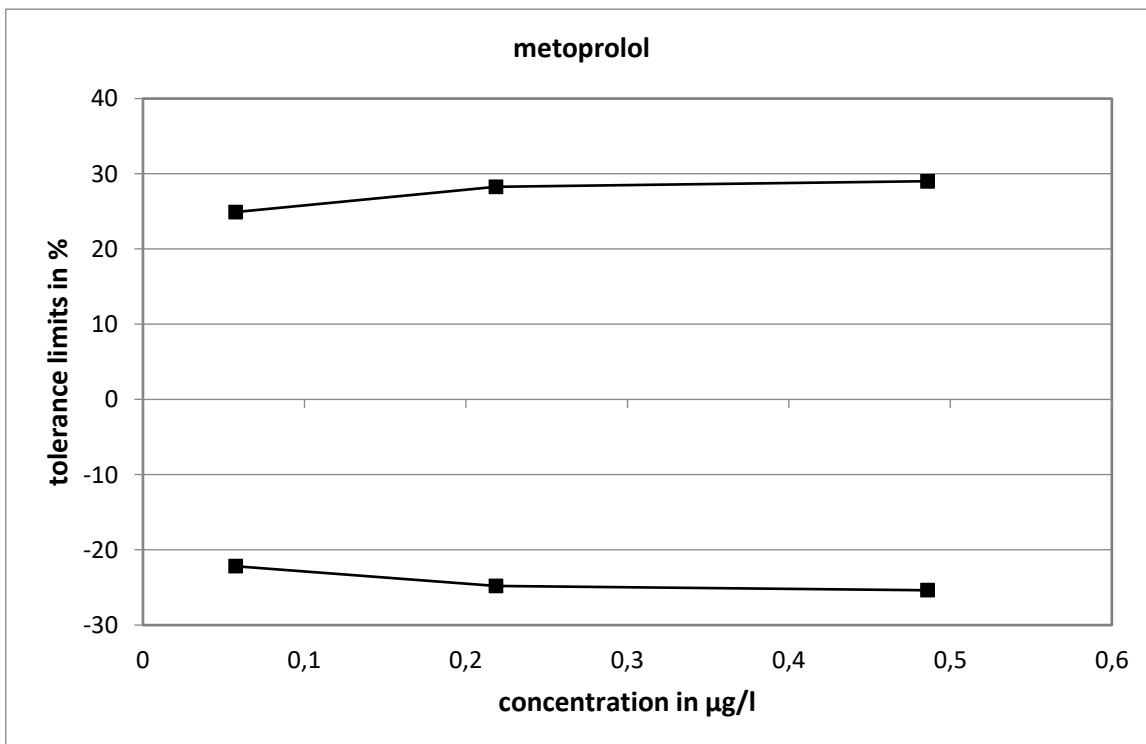
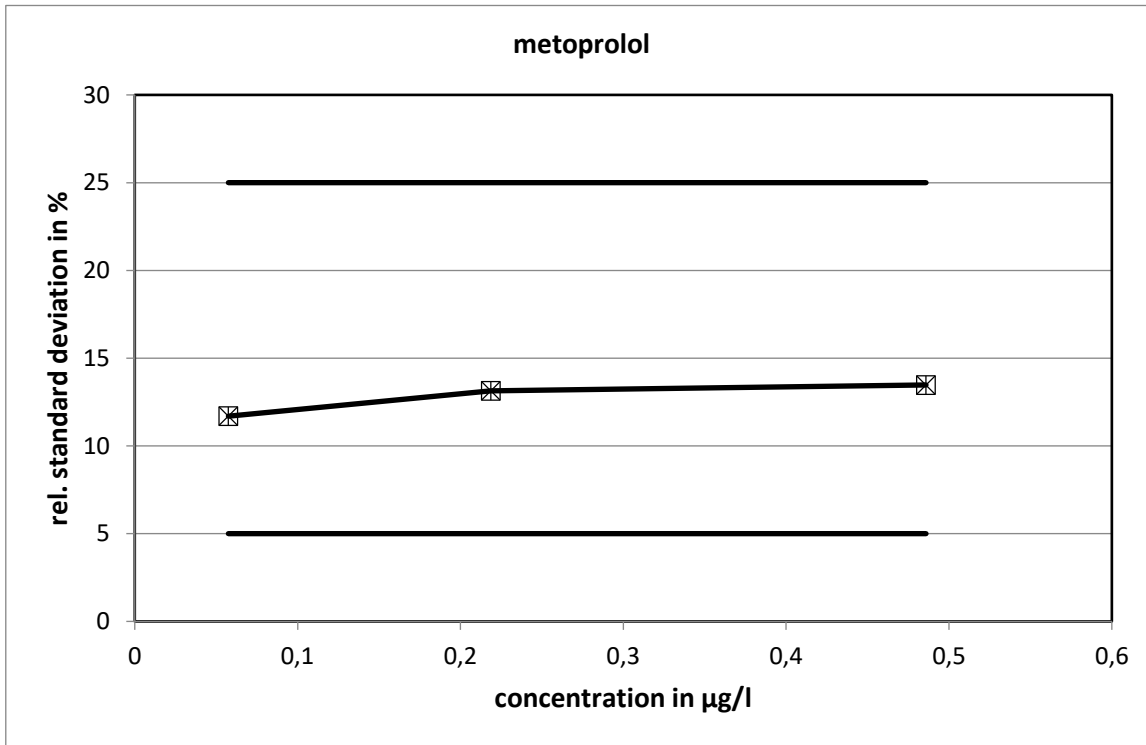
level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,0575	4,68	0,0067	0,0067	11,69	0,0718	0,0447	24,92	-22,18	39	2	2	10,3
2	0,2186	5,26	0,0287	0,0287	13,15	0,2804	0,1645	28,25	-24,78	39	1	2	7,7
3	0,4859	5,39	0,0655	0,0655	13,47	0,6268	0,3626	29,02	-25,37	39	1	2	7,7
sum										117	4	6	8,5

## Recovery and matrix content



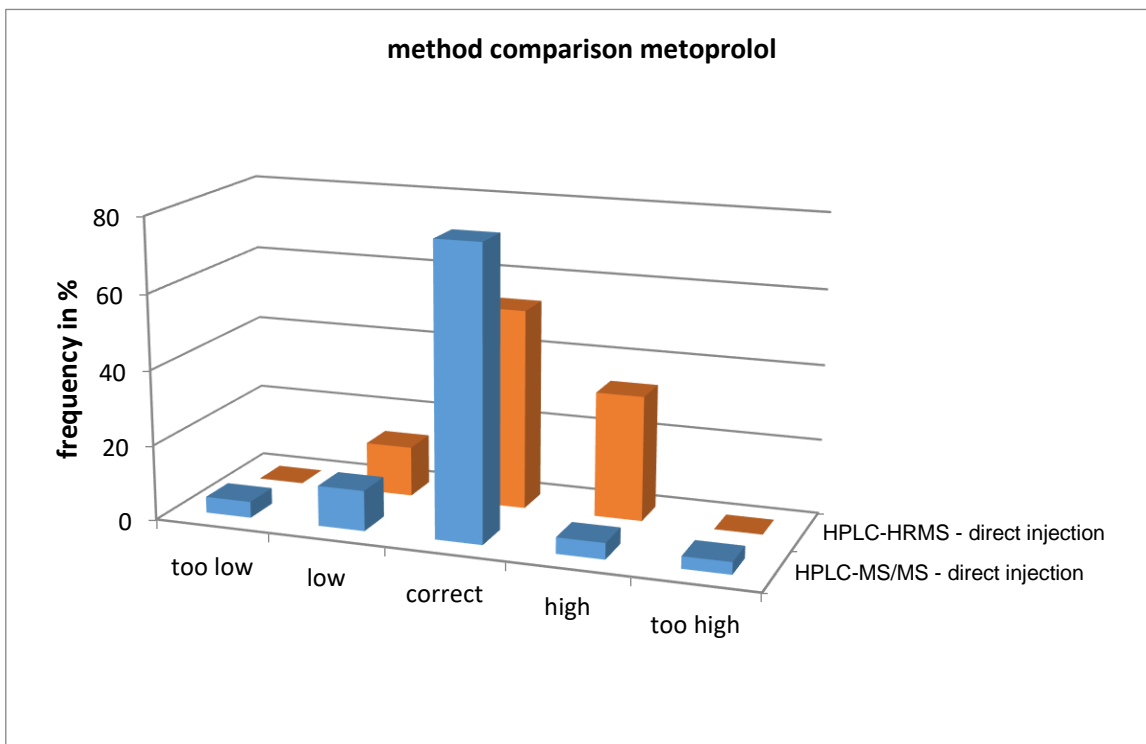
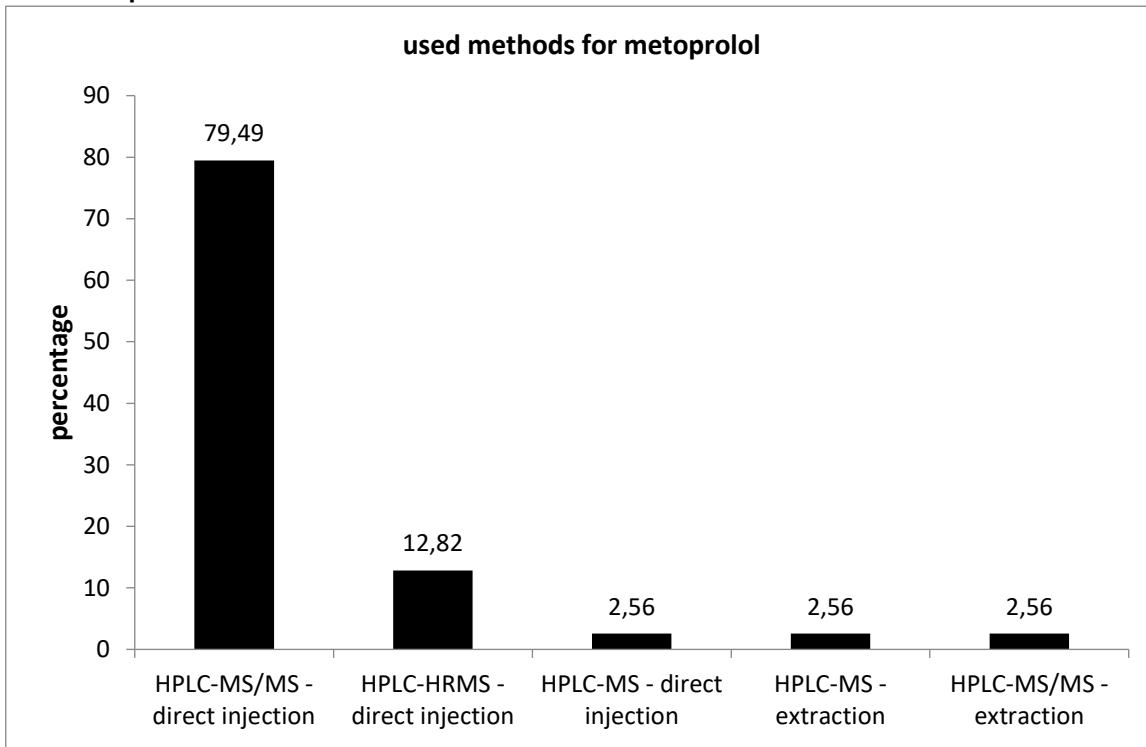
Slope of the regression line: 1,01; average recovery: 101 %  
 no matrix content

Relative standard deviation and tolerance limits





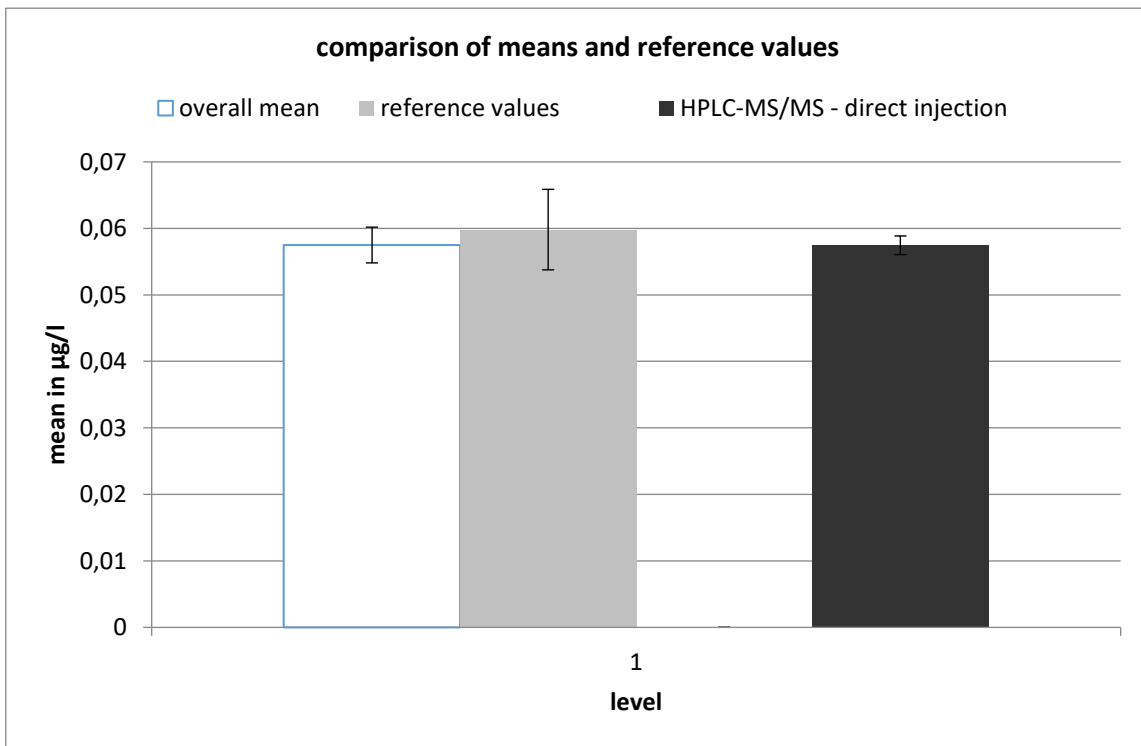
Method specific evaluation

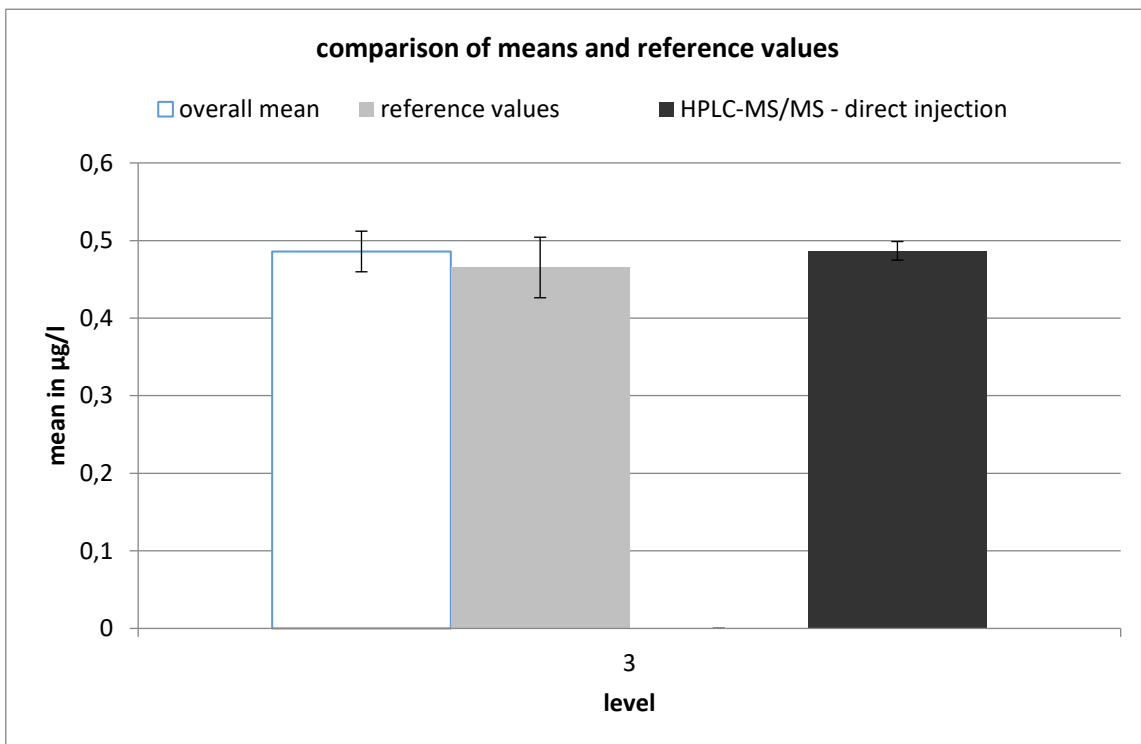
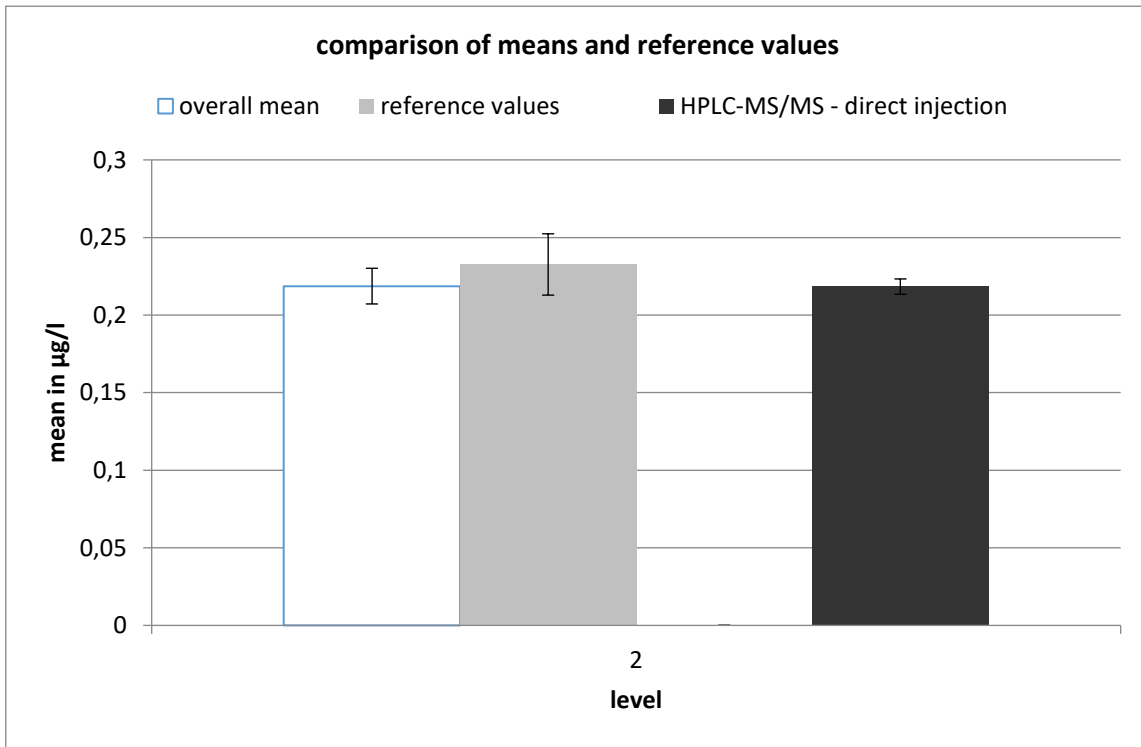


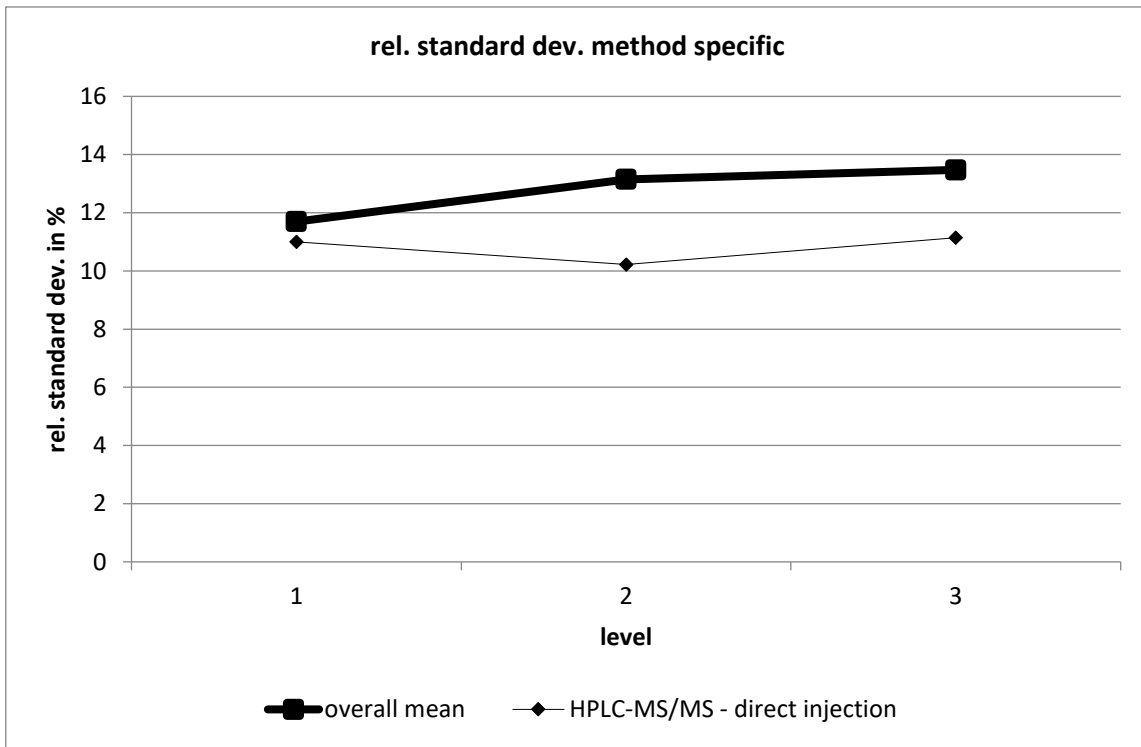
Given the small number of participants, no significant differences.

**Comparison of means and reference values**

level	Experimental Data			Reference Data		
	mean [ $\mu\text{g/l}$ ]	exp. uncertainty [ $\mu\text{g/l}$ ]	exp. uncertainty [%]	reference value [ $\mu\text{g/l}$ ]	exp. uncertainty [ $\mu\text{g/l}$ ]	exp. uncertainty [%]
1	0,0575	0,0027	4,7	0,0598	0,0061	10,1
2	0,2186	0,0115	5,3	0,2326	0,0197	8,5
3	0,4859	0,0262	5,4	0,4652	0,0390	8,4





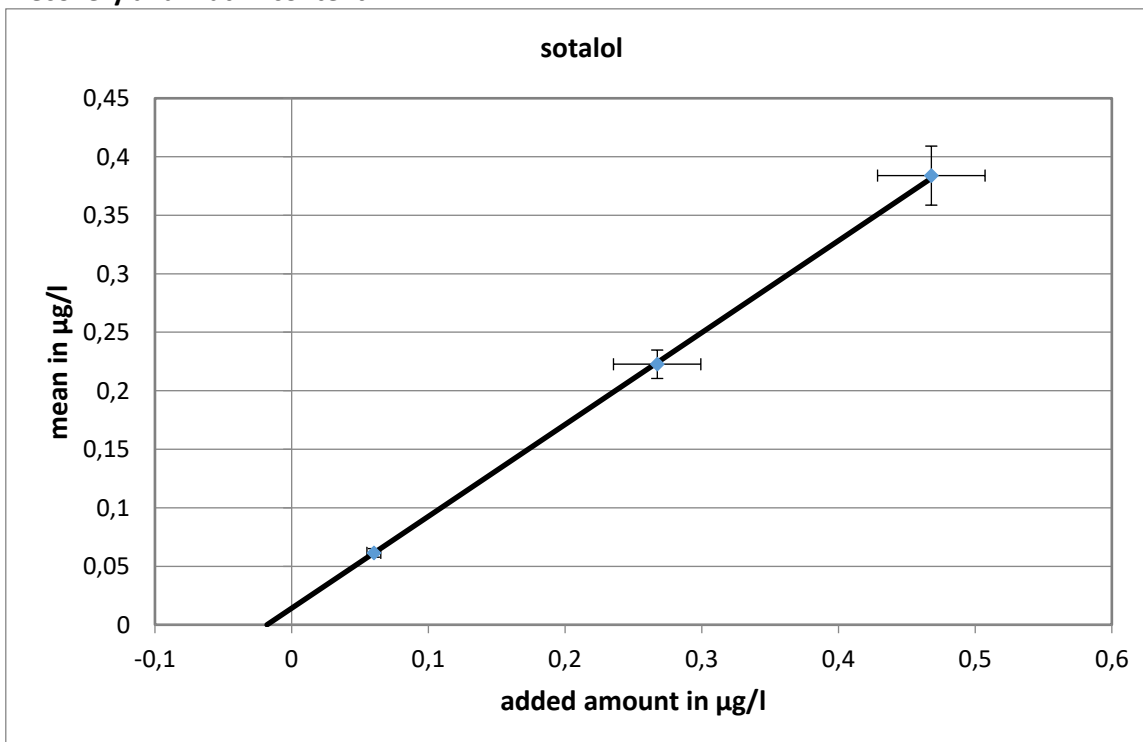


HPLC-MS/MS - direct injection									
level	robust mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [%]	robust standard deviation [ $\mu\text{g/l}$ ]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,057	0,001	2,431	0,006	11	32	2	2	12,5
2	0,218	0,005	2,259	0,022	10,22	32	2	3	15,63
3	0,487	0,012	2,462	0,054	11,14	32	2	1	9,375

# sotalol

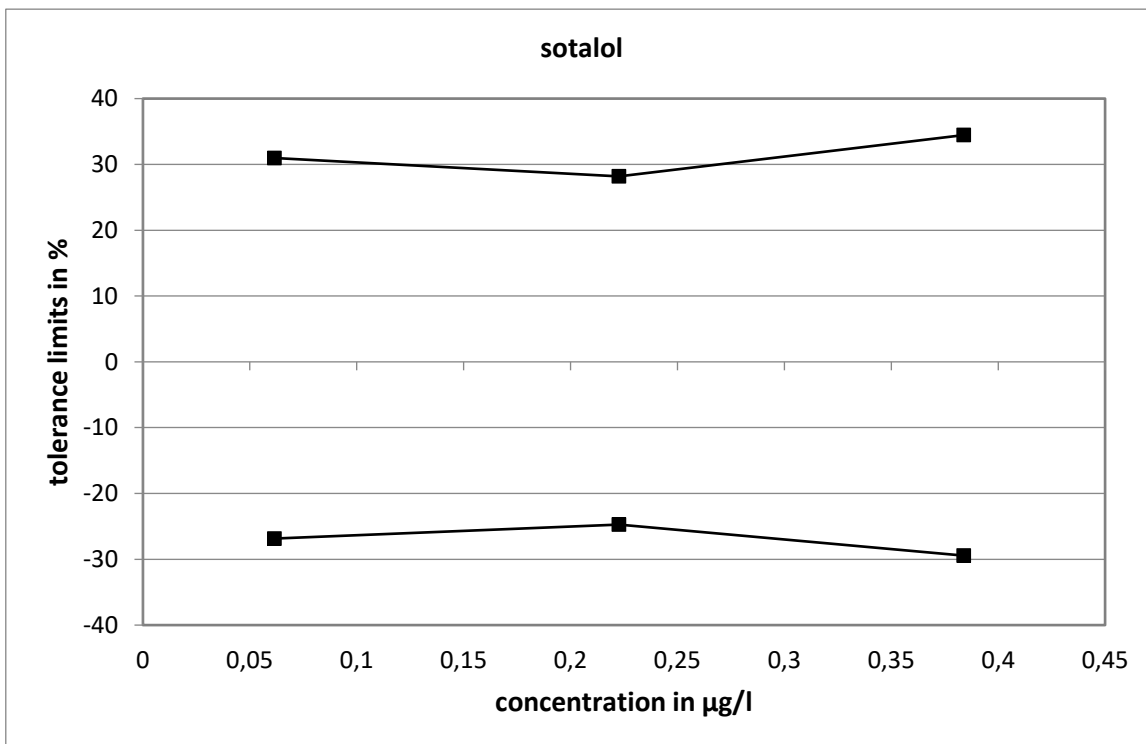
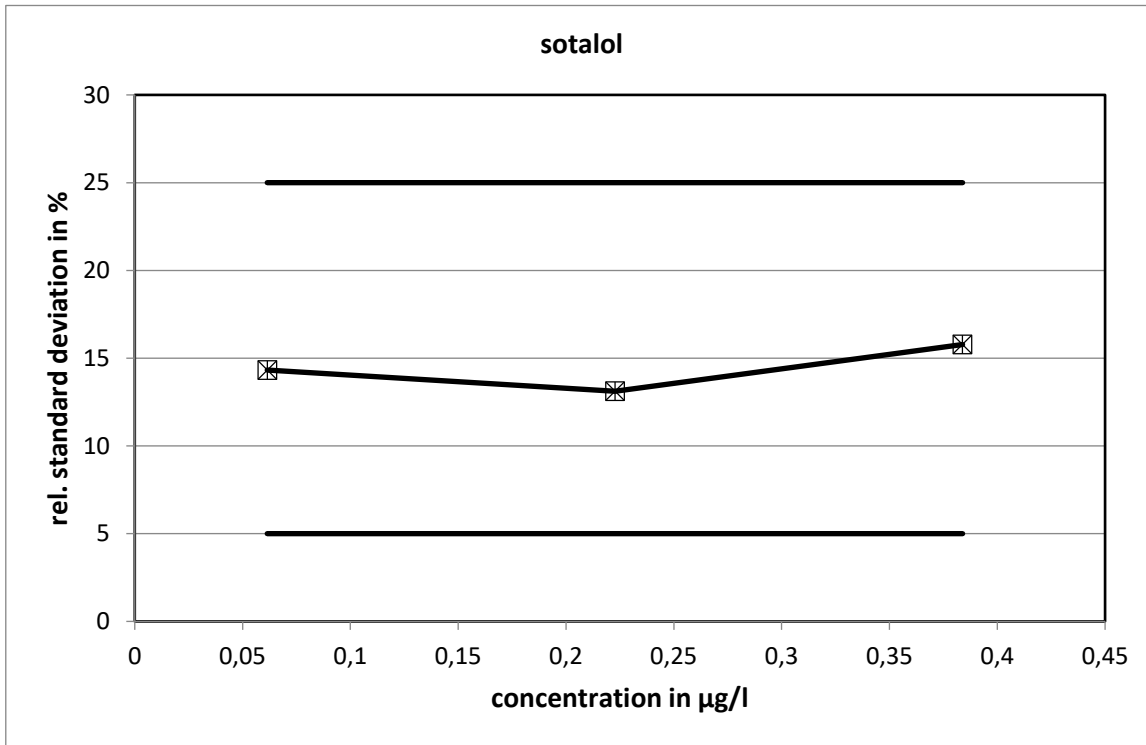
level	assigned value [µg/l]	expanded uncertainty of the assigned value [%]	standard deviation, calculated using robust statistics [µg/l]	standard deviation for proficiency assessment [µg/l]	standard deviation for proficiency assessment [%]	upper tolerance limit [µg/l]	lower tolerance limit [µg/l]	upper tolerance limit [%]	lower tolerance limit [%]	number of results	out below	out above	out [%]
1	0,0614	5,97	0,0088	0,0088	14,32	0,0805	0,0449	31,00	-26,87	36	1	2	8,3
2	0,2227	5,46	0,0292	0,0292	13,11	0,2854	0,1676	28,18	-24,73	36	1	3	11,1
3	0,3839	6,57	0,0606	0,0606	15,78	0,5162	0,2709	34,46	-29,44	36	1	2	8,3
sum										108	3	7	9,3

## Recovery and matrix content

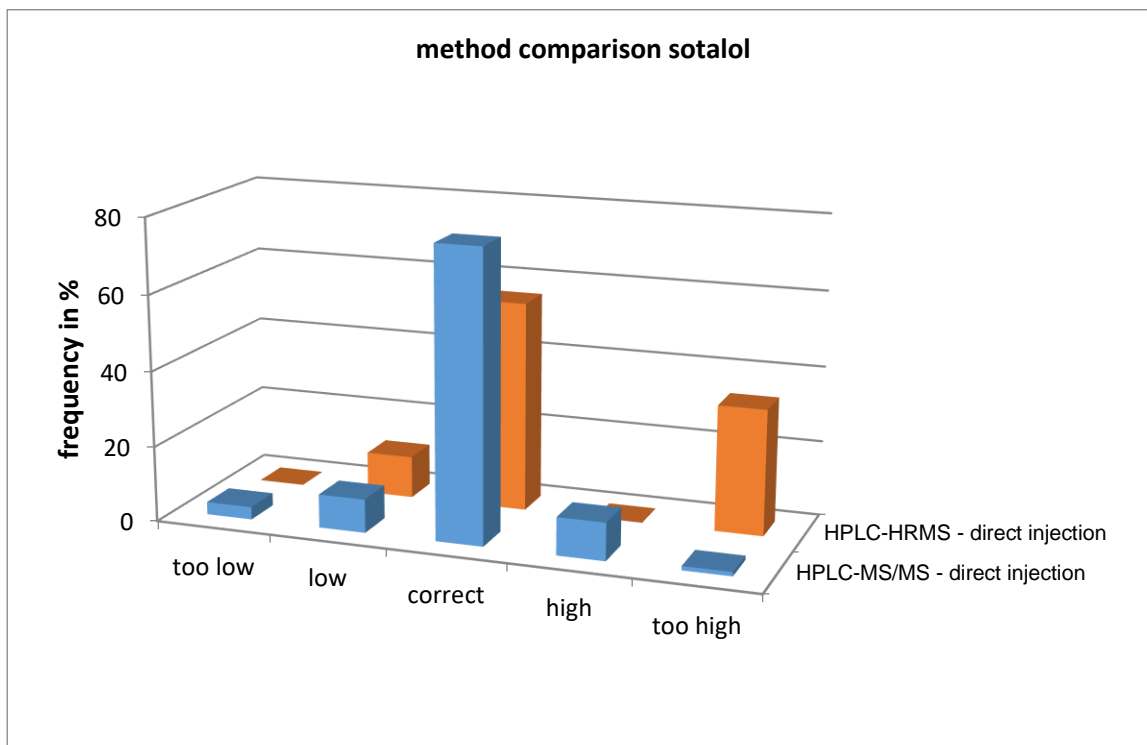
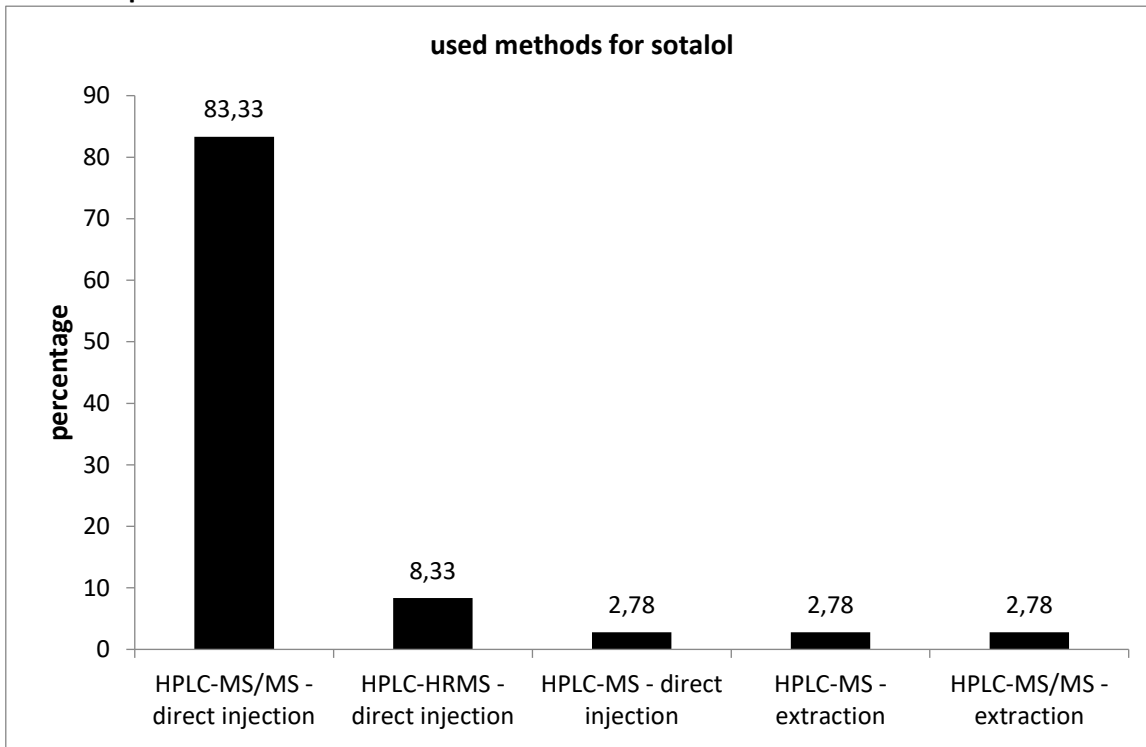


Slope of the regression line: 0,79; average recovery: 79 %  
 calculated matrix content: 0,018 µg/l, uncertainty of the matrix content: 100%

Relative standard deviation and tolerance limits



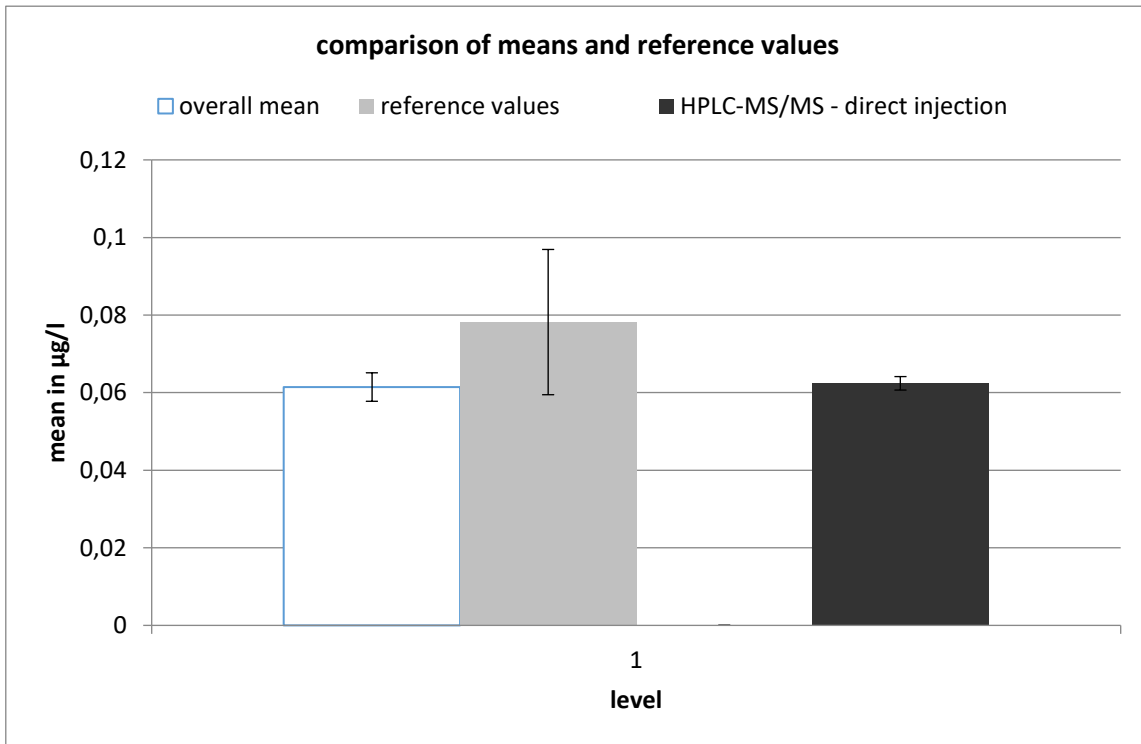
Method specific evaluation



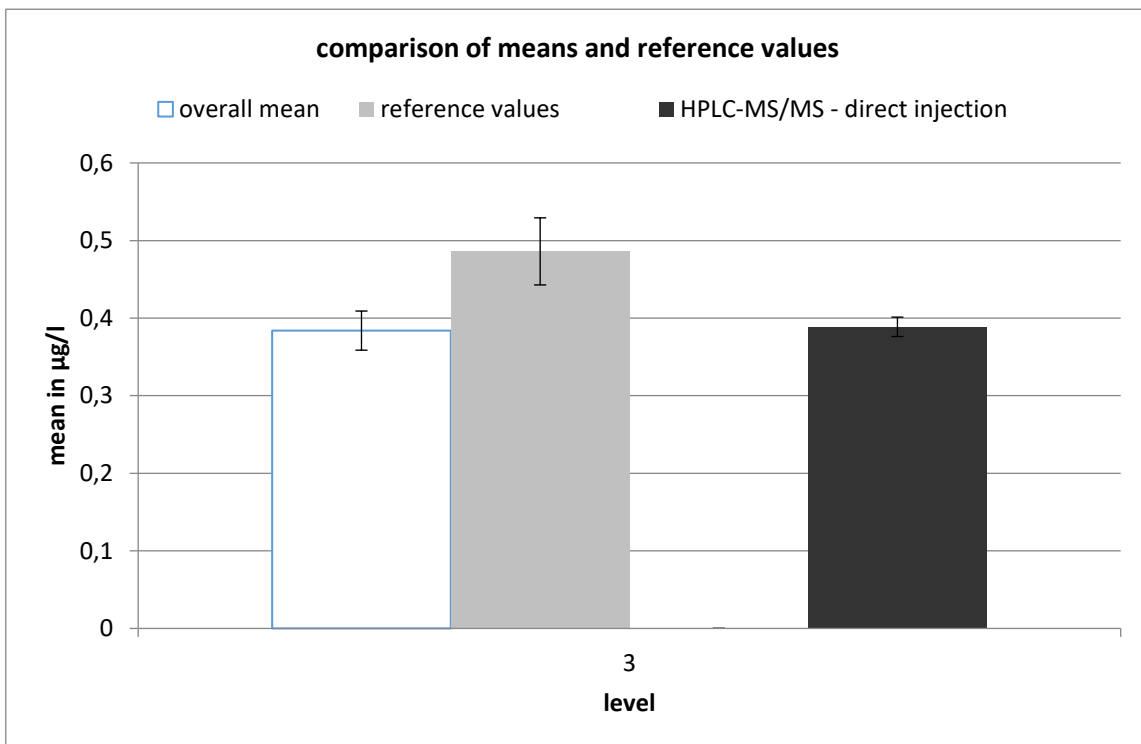
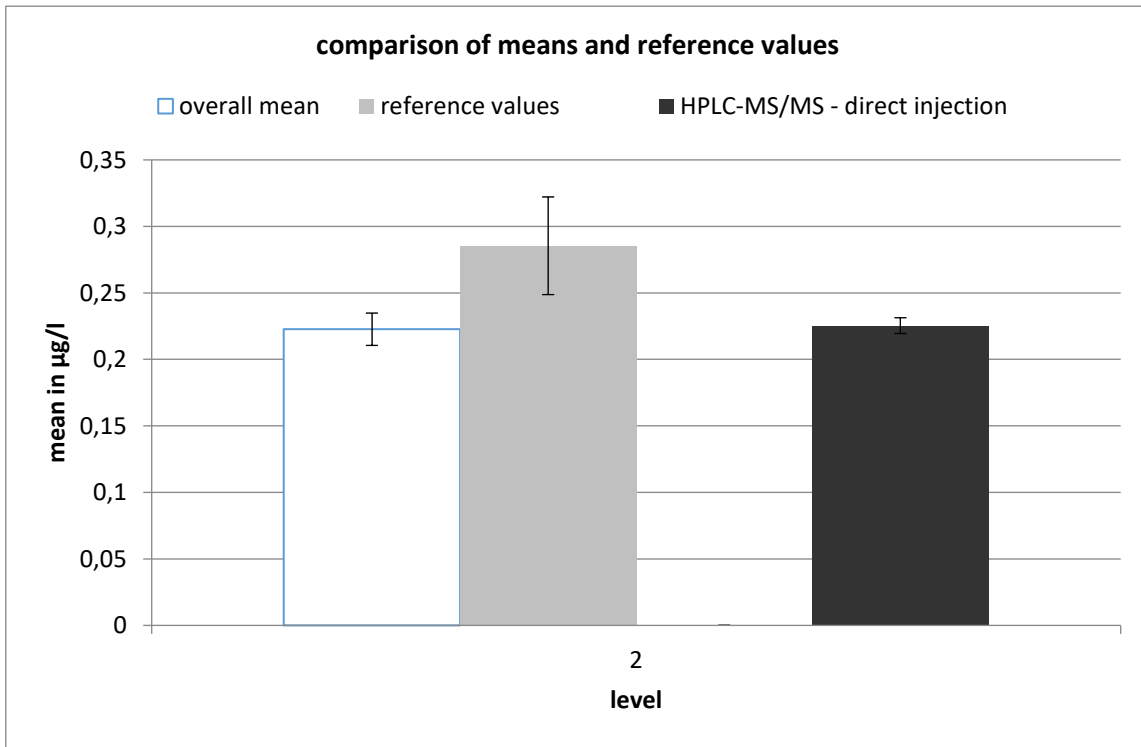
Given the small number of participants, no significant differences.

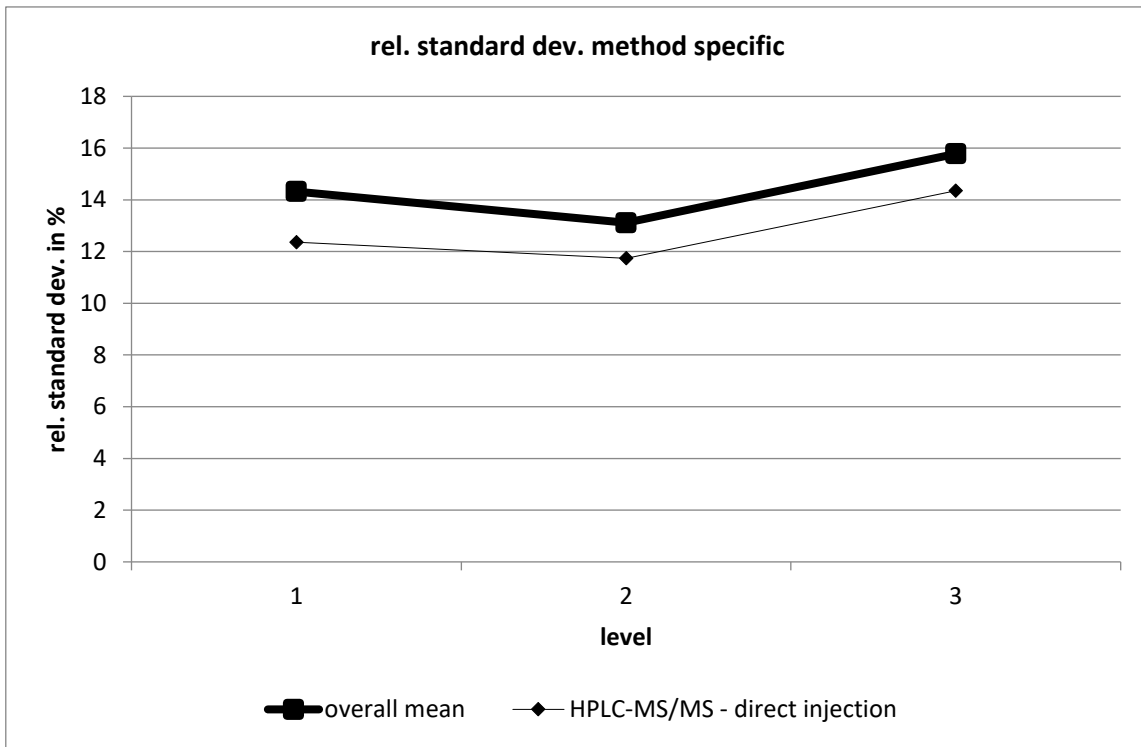
**Comparison of means and reference values**

level	mean [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]	reference value [µg/l]	exp. uncertainty [µg/l]	exp. uncertainty [%]
1	0,0614	0,0037	6,0	0,0782	0,0187	23,9
2	0,2227	0,0122	5,5	0,2854	0,0367	12,9
3	0,3839	0,0252	6,6	0,4860	0,0432	8,9

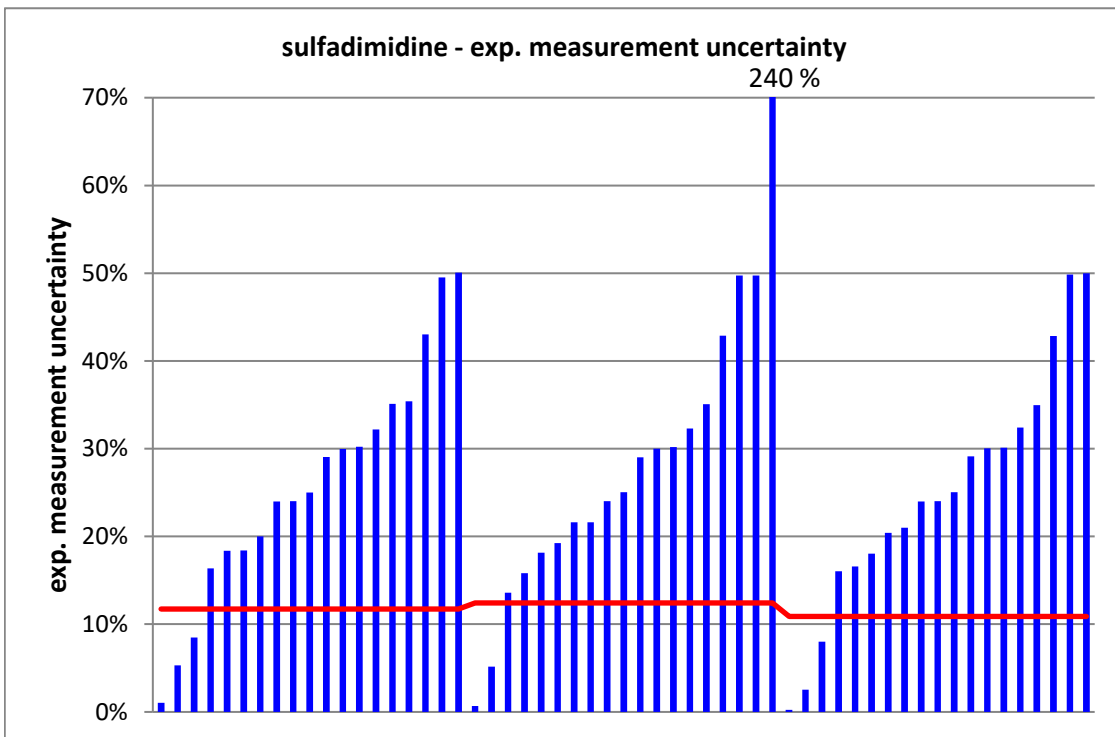
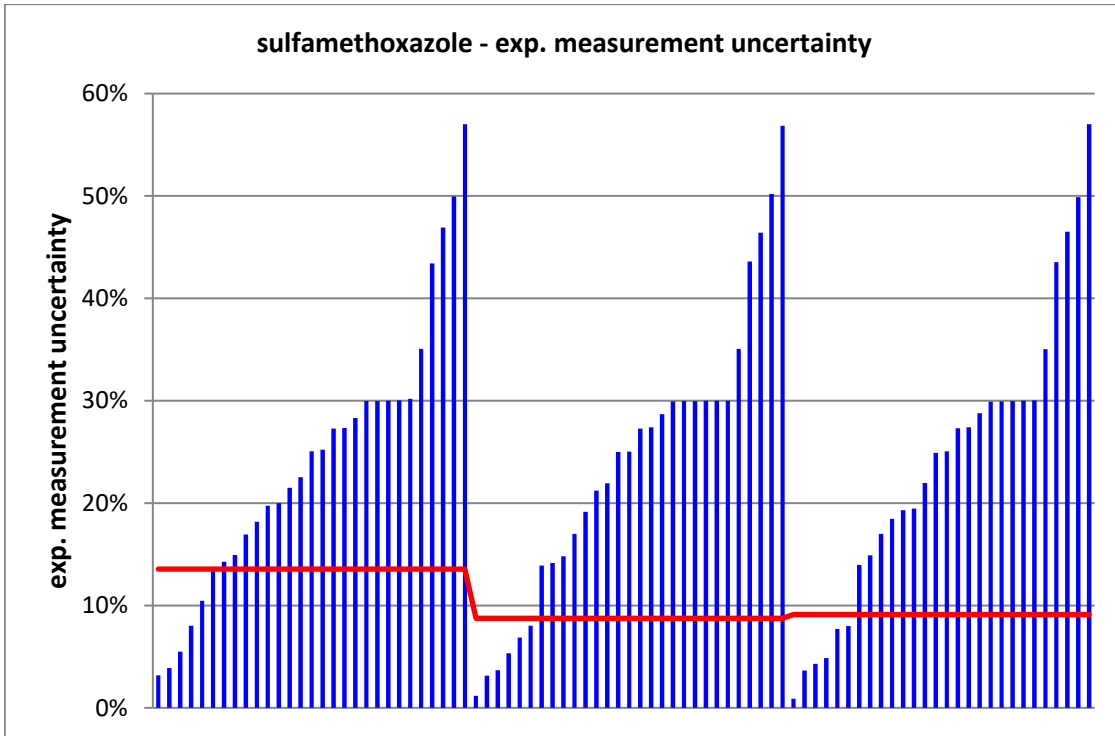


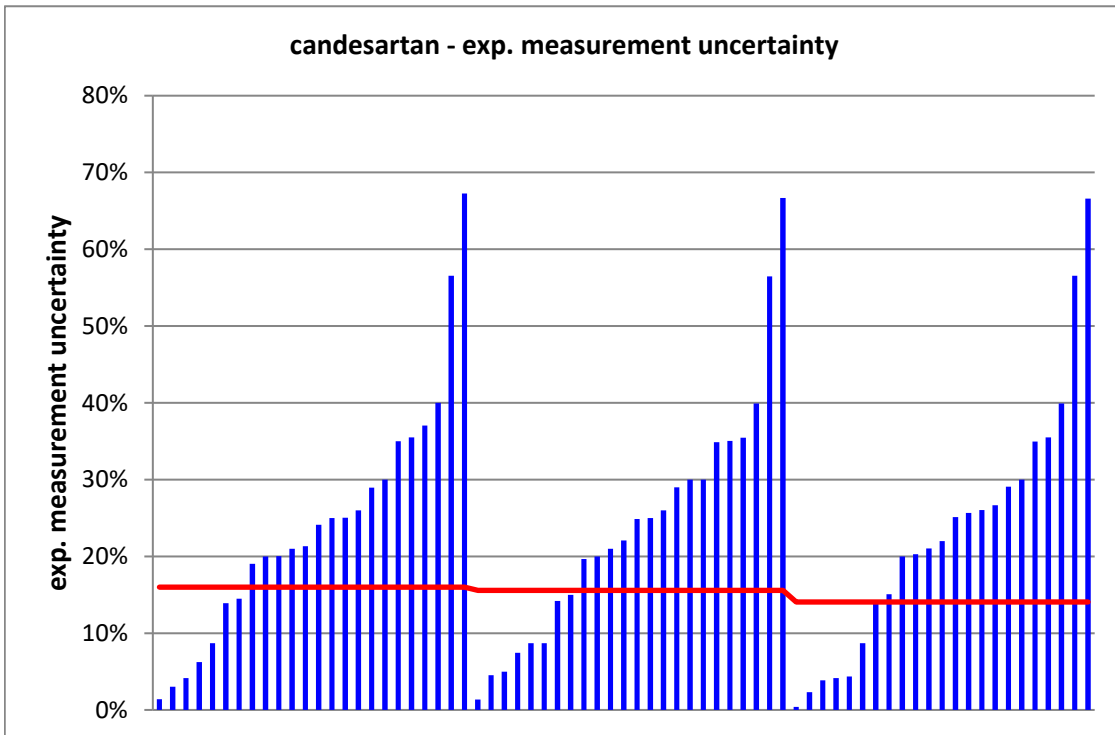
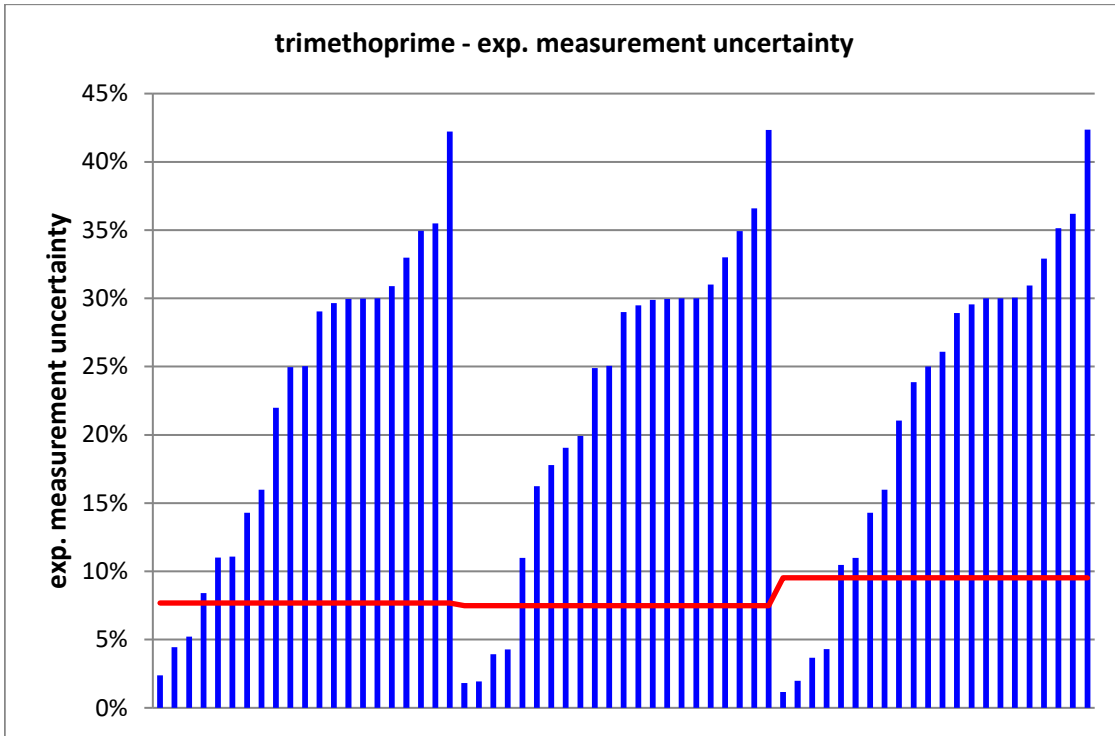


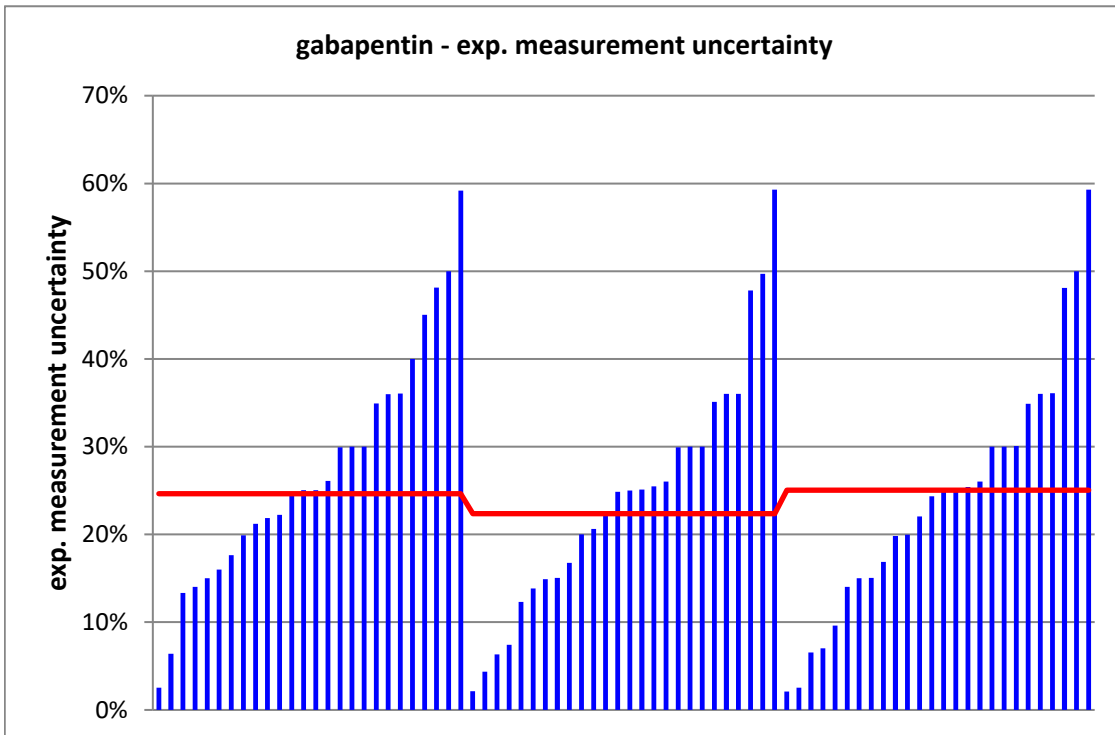
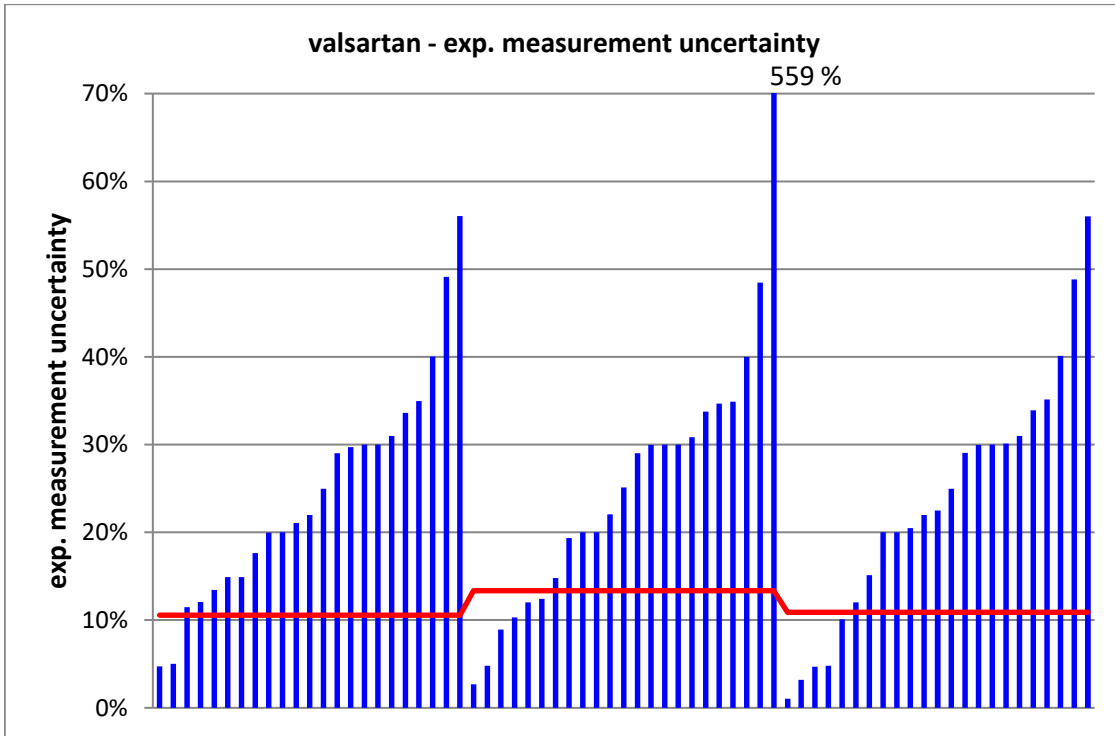


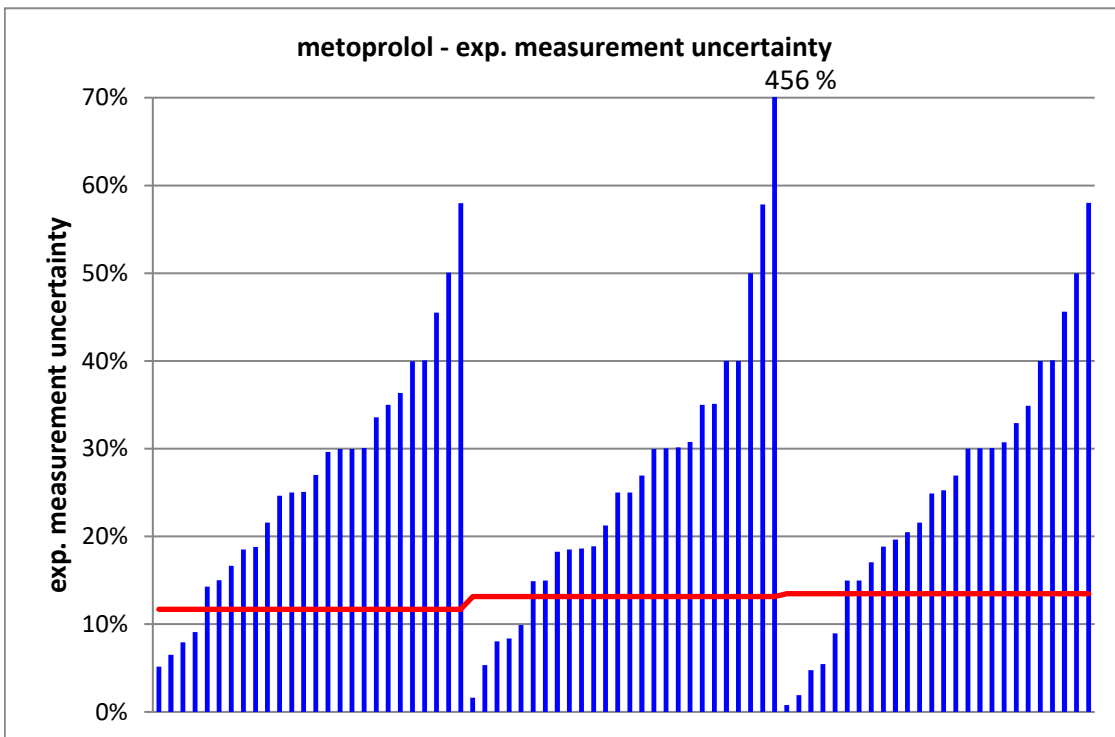
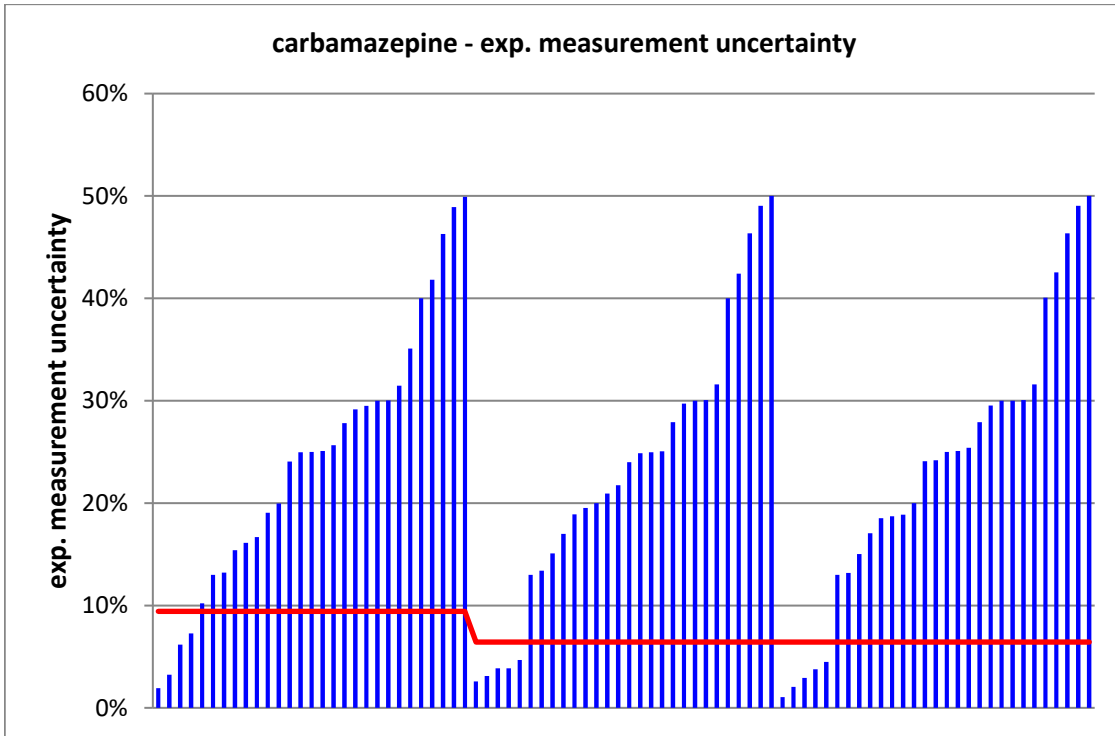


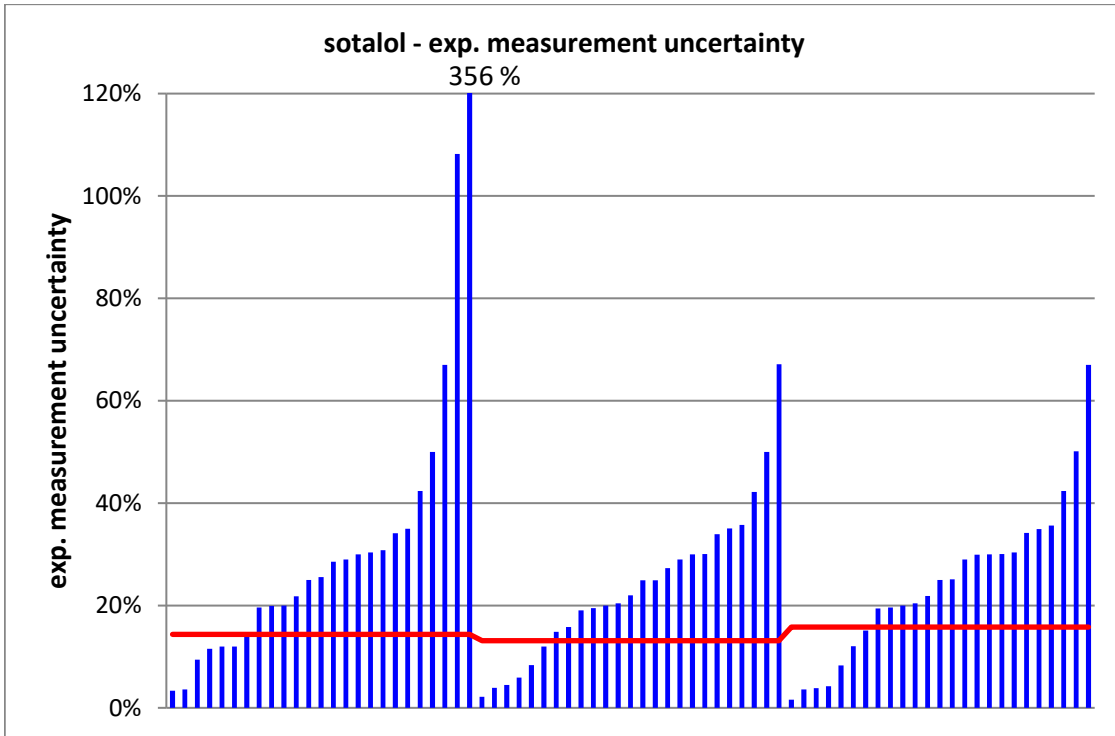
HPLC-MS/MS - direct injection									
level	robust mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [ $\mu\text{g/l}$ ]	exp. unc. of the mean [%]	robust standard deviation [ $\mu\text{g/l}$ ]	robust standard deviation [%]	number of results	out below	out above	out [%]
1	0,062	0,002	2,775	0,008	12,36	31	1	1	6,452
2	0,225	0,006	2,635	0,026	11,74	31	1	2	9,677
3	0,389	0,013	3,222	0,056	14,35	31	1	0	3,226









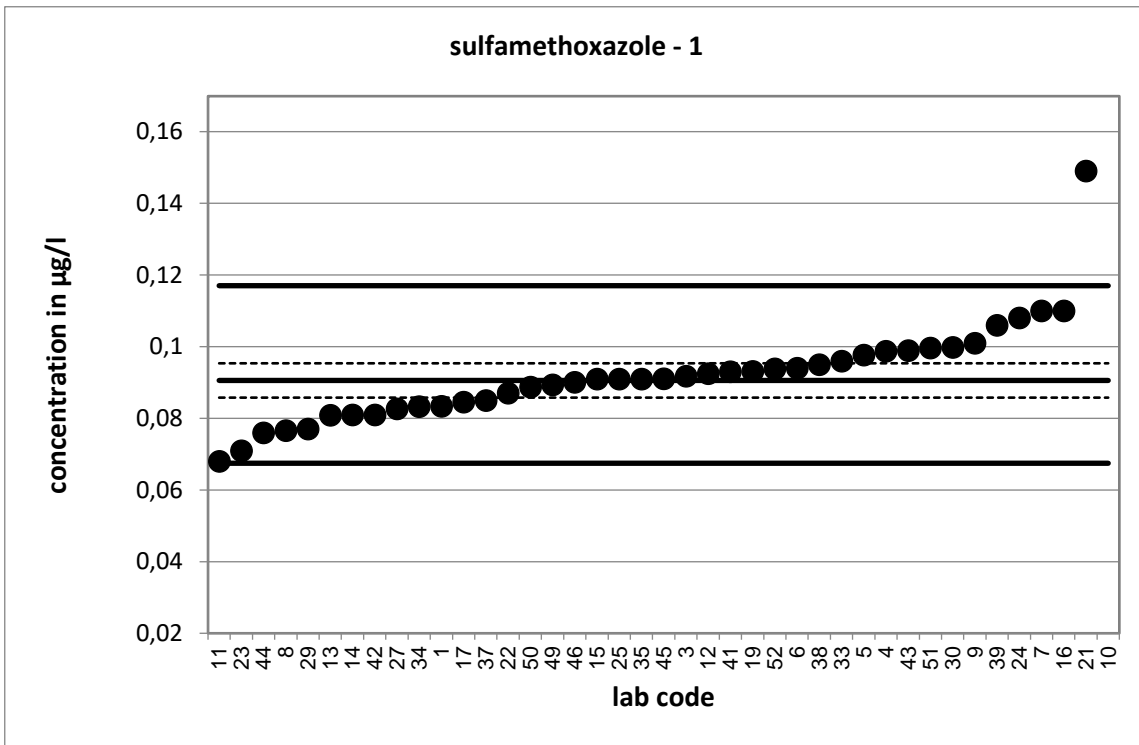


PT 4/23 - TW S2		sulfamethoxazole - 1			
assigned value [ $\mu\text{g/l}$ ]*		0,09056 $\pm$ 0,00479			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,117			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,06746			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,0834	0,025	-0,6	-0,6	s
3	0,0918	0,023	0,1	0,1	s
4	0,0987	0,035	0,5	0,6	s
5	0,0977	0,008	1,6	0,5	s
6	0,094			0,3	s
7	0,11	0,02	1,9	1,5	s
8	0,0766			-1,2	s
9	0,101	0,017	1,2	0,8	s
10	0,5	0,15	5,5	31,0	u
11	0,068			-2,0	s
12	0,0925	0,025	0,2	0,1	s
13	0,0809	0,04	-0,5	-0,8	s
14	0,081			-0,8	s
15	0,091			0,0	s
16	0,11	0,03	1,3	1,5	s
17	0,0845			-0,5	s
19	0,0931			0,2	s
21	0,149	0,045	2,6	4,4	u
22	0,087	0,013	-0,5	-0,3	s
23	0,071	0,016	-2,3	-1,7	s
24	0,108			1,3	s
25	0,091	0,013	0,1	0,0	s
27	0,0827	0,036	-0,4	-0,7	s
29	0,077	0,003	-4,8	-1,2	s
30	0,0998	0,057	0,3	0,7	s
33	0,096			0,4	s
34	0,0833	0,021	-0,7	-0,6	s
35	0,091	0,005	0,1	0,0	s
37	0,085	0,017	-0,6	-0,5	s
38	0,095	0,003	1,6	0,3	s
39	0,106	0,03	1,0	1,2	s
41	0,093	0,02	0,2	0,2	s
42	0,081	0,038	-0,5	-0,8	s
43	0,0989	0,03	0,6	0,6	s
44	0,076	0,015	-1,8	-1,3	s
45	0,0911	0,027	0,0	0,0	s
46	0,0901			0,0	s
49	0,0894			-0,1	s
50	0,0887	0,012	-0,3	-0,2	s
51	0,0996			0,7	s
52	0,0938	0,01	0,6	0,2	s

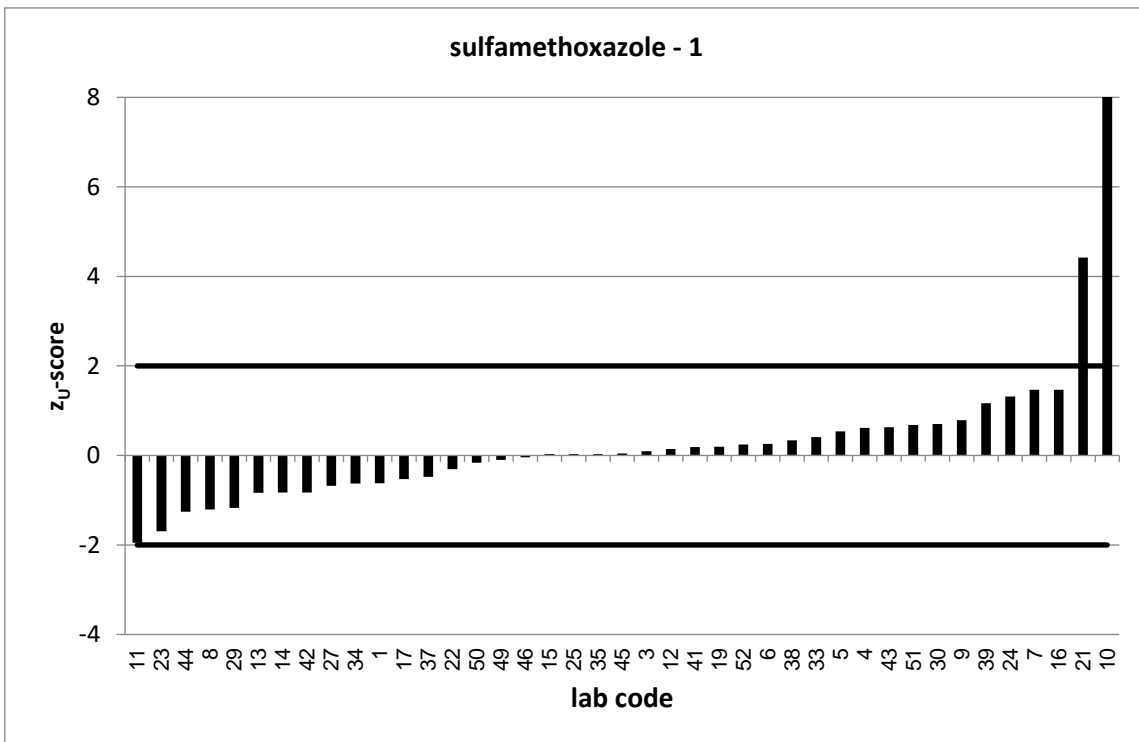
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

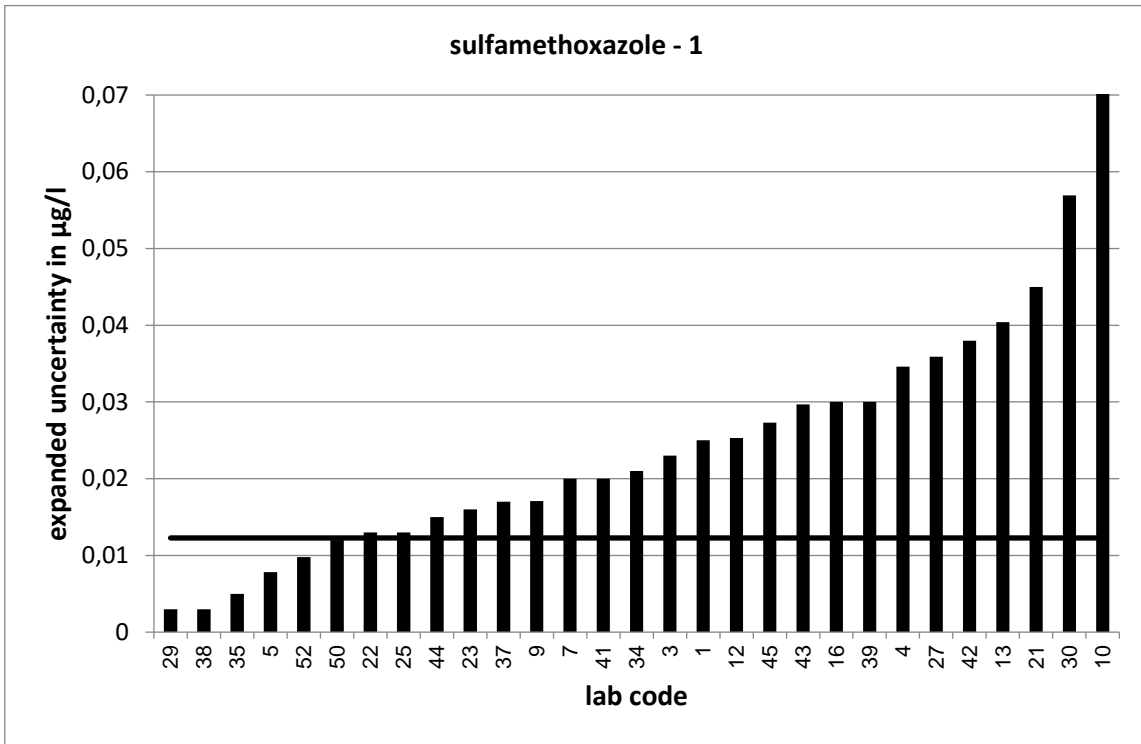




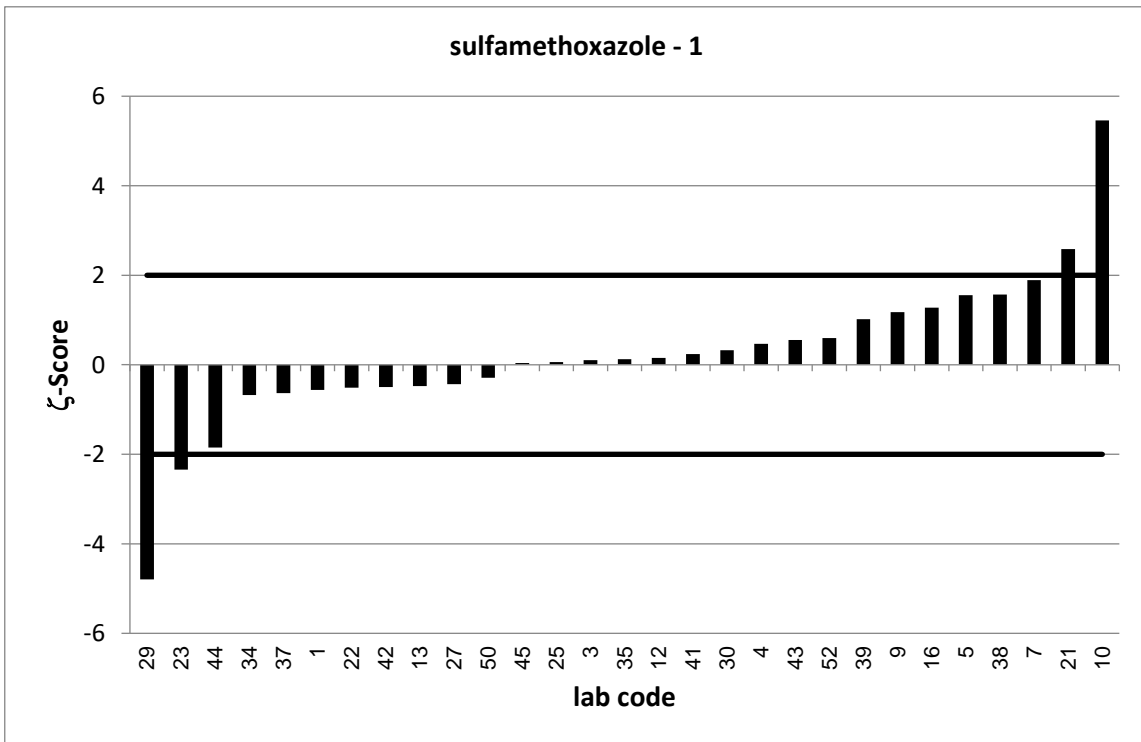
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



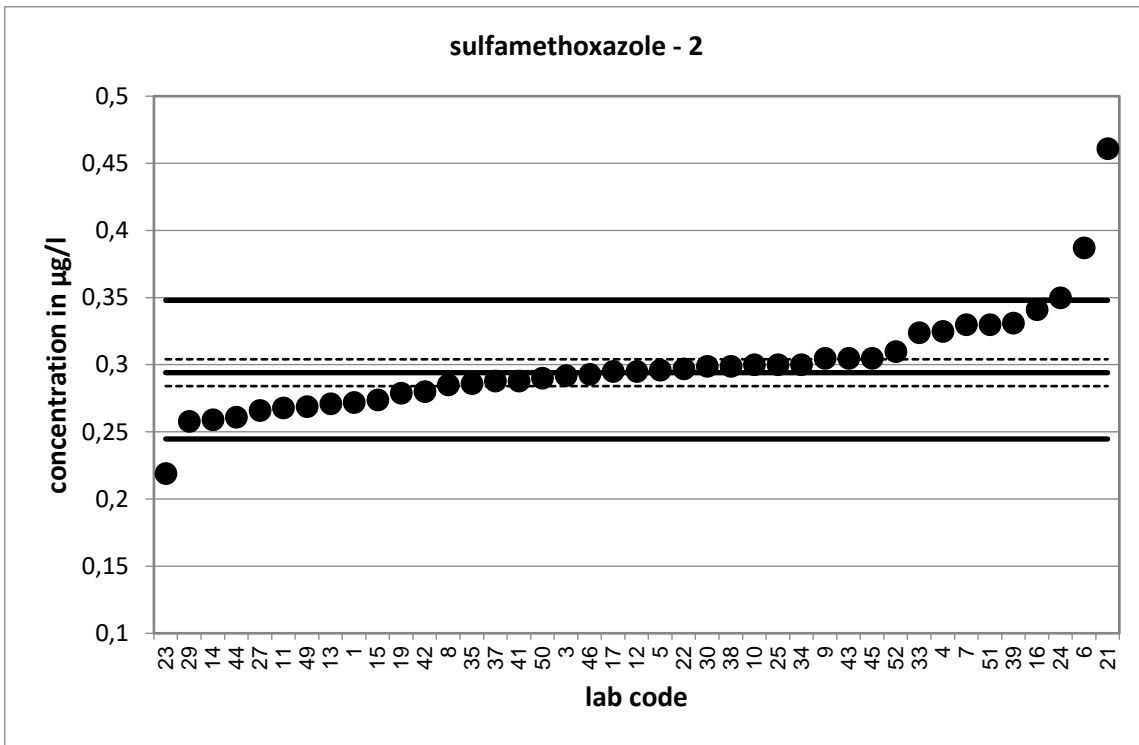
Strongly deviating values are not correctly shown in the diagram.



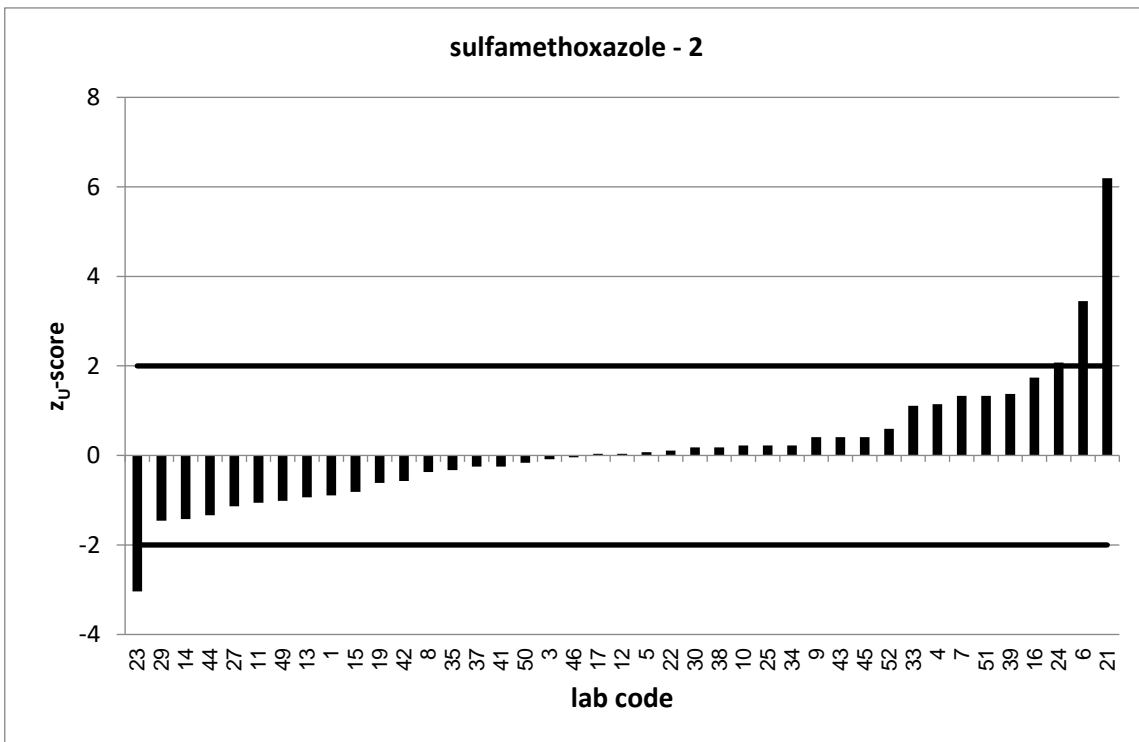
PT 4/23 - TW S2		sulfamethoxazole - 2			
assigned value [ $\mu\text{g/l}$ ]*		0,2941 $\pm$ 0,01			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,3479			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,2447			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,272	0,082	-0,5	-0,9	s
3	0,292	0,073	-0,1	-0,1	s
4	0,325	0,114	0,5	1,1	s
5	0,296	0,024	0,2	0,1	s
6	0,387			3,4	u
7	0,33	0,07	1,0	1,3	s
8	0,285			-0,4	s
9	0,305	0,052	0,4	0,4	s
10	0,3	0,09	0,1	0,2	s
11	0,268			-1,1	s
12	0,2951	0,081	0,0	0,0	s
13	0,271	0,136	-0,3	-0,9	s
14	0,259			-1,4	s
15	0,274			-0,8	s
16	0,341	0,093	1,0	1,7	s
17	0,295			0,0	s
19	0,279			-0,6	s
21	0,461	0,138	2,4	6,2	u
22	0,297	0,044	0,1	0,1	s
23	0,219	0,048	-3,1	-3,0	u
24	0,35			2,1	q
25	0,3	0,016	0,6	0,2	s
27	0,266	0,116	-0,5	-1,1	s
29	0,258	0,003	-6,9	-1,5	s
30	0,299	0,17	0,1	0,2	s
33	0,324			1,1	s
34	0,3	0,075	0,2	0,2	s
35	0,286	0,009	-1,2	-0,3	s
37	0,288	0,086	-0,1	-0,2	s
38	0,299	0,011	0,7	0,2	s
39	0,331	0,095	0,8	1,4	s
41	0,288	0,04	-0,3	-0,2	s
42	0,28	0,13	-0,2	-0,6	s
43	0,305	0,091	0,2	0,4	s
44	0,261	0,05	-1,3	-1,3	s
45	0,305	0,091	0,2	0,4	s
46	0,293			0,0	s
49	0,269			-1,0	s
50	0,29	0,041	-0,2	-0,2	s
51	0,33			1,3	s
52	0,31	0,021	1,4	0,6	s

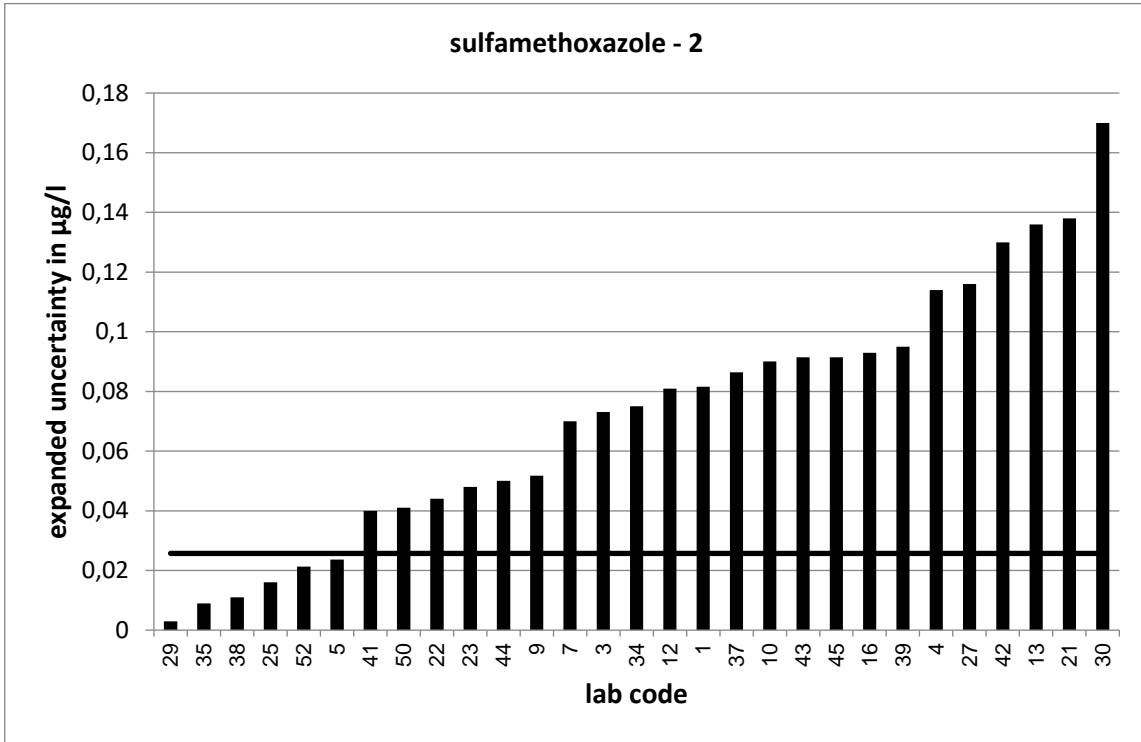
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

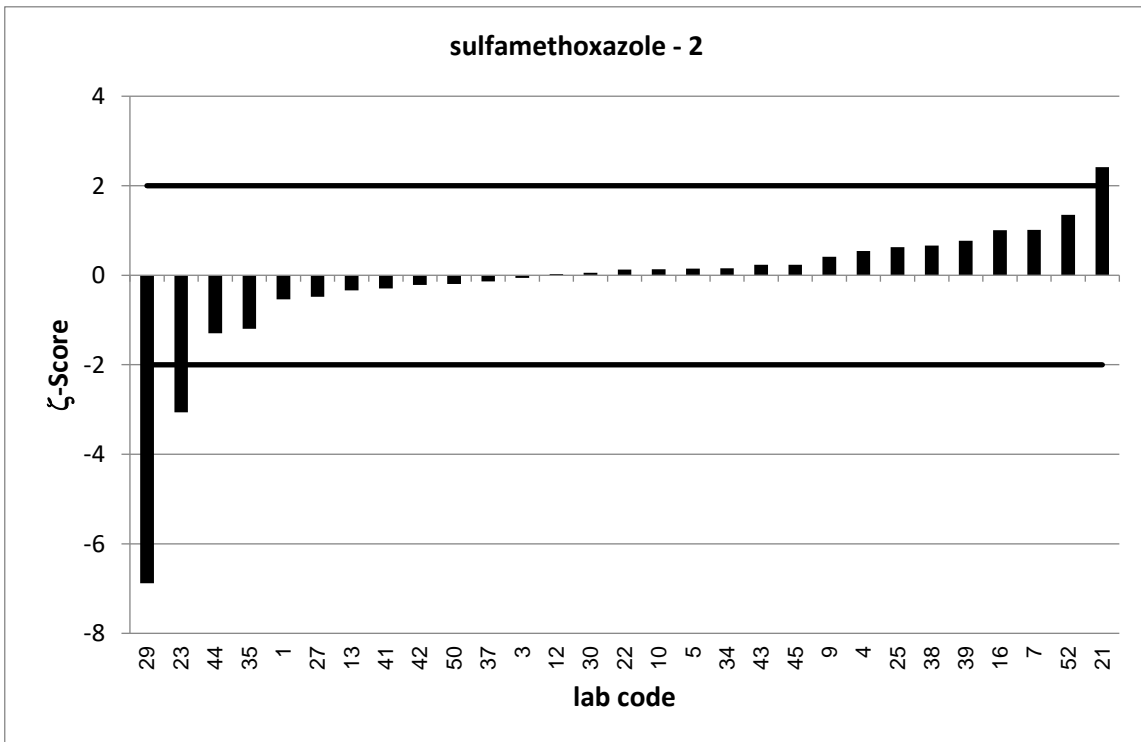


Strongly deviating values are not shown in the diagram.





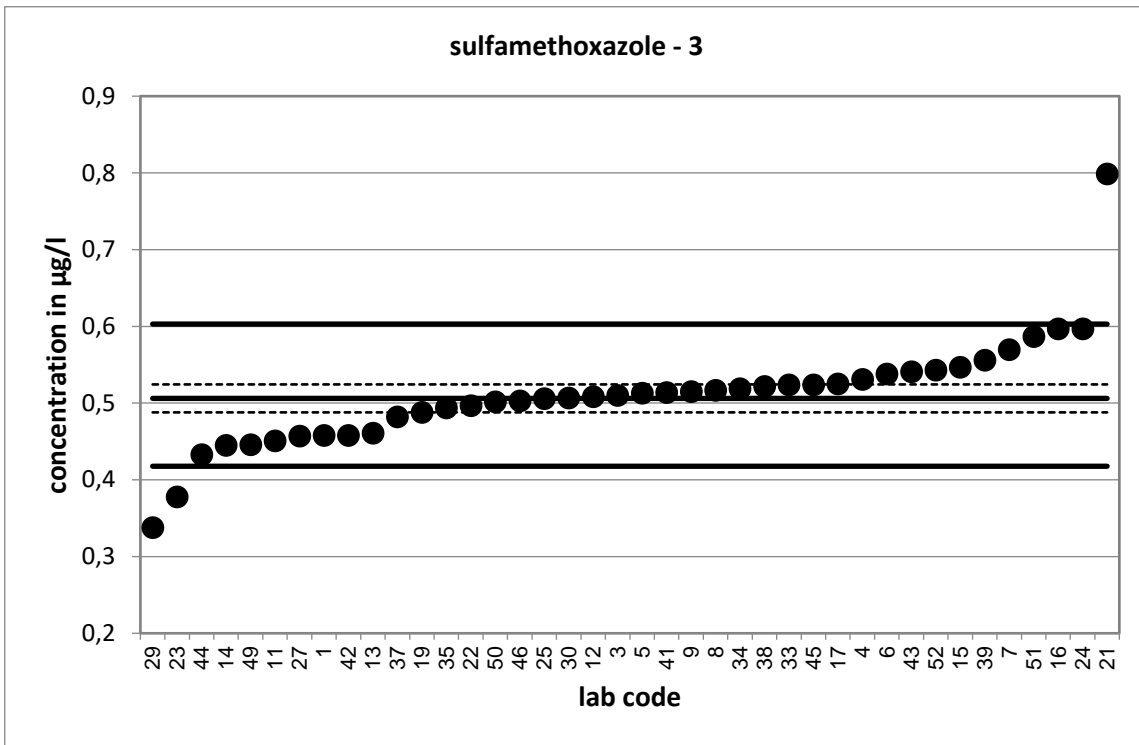
Strongly deviating values are not correctly shown in the diagram.



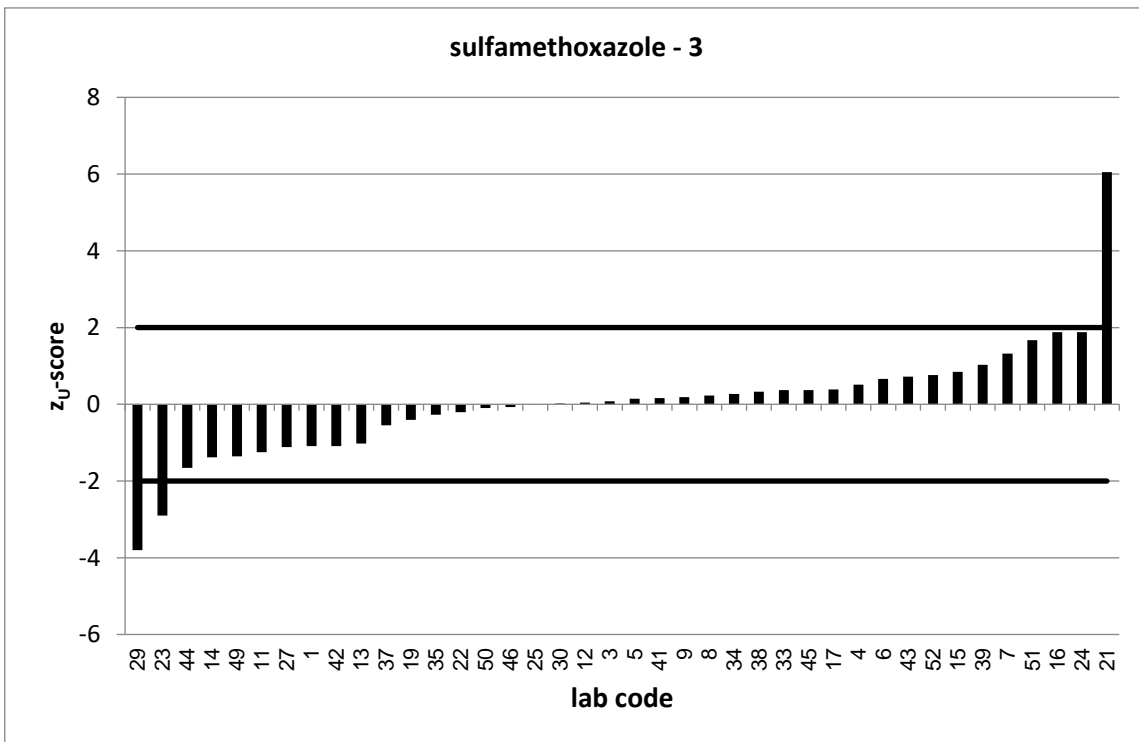
PT 4/23 - TW S2		sulfamethoxazole - 3			
assigned value [ $\mu\text{g/l}$ ]*		0,5061 $\pm$ 0,0182			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,603			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,4177			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,458	0,137	-0,7	-1,1	s
3	0,51	0,127	0,1	0,1	s
4	0,531	0,186	0,3	0,5	s
5	0,513	0,041	0,3	0,1	s
6	0,538			0,7	s
7	0,57	0,11	1,1	1,3	s
8	0,517			0,2	s
9	0,515	0,088	0,2	0,2	s
11	0,451			-1,2	s
12	0,5083	0,139	0,0	0,0	s
13	0,461	0,23	-0,4	-1,0	s
14	0,445			-1,4	s
15	0,547			0,8	s
16	0,597	0,163	1,1	1,9	s
17	0,525			0,4	s
19	0,488			-0,4	s
21	0,799	0,24	2,4	6,0	u
22	0,497	0,074	-0,2	-0,2	s
23	0,378	0,083	-3,0	-2,9	q
24	0,597			1,9	s
25	0,506	0,039	0,0	0,0	s
27	0,457	0,199	-0,5	-1,1	s
29	0,338	0,003	-18,2	-3,8	u
30	0,507	0,289	0,0	0,0	s
33	0,524			0,4	s
34	0,519	0,13	0,2	0,3	s
35	0,494	0,024	-0,8	-0,3	s
37	0,482	0,145	-0,3	-0,5	s
38	0,522	0,019	1,2	0,3	s
39	0,556	0,16	0,6	1,0	s
41	0,514	0,1	0,2	0,2	s
42	0,458	0,213	-0,5	-1,1	s
43	0,541	0,162	0,4	0,7	s
44	0,433	0,08	-1,8	-1,7	s
45	0,524	0,157	0,2	0,4	s
46	0,503			-0,1	s
49	0,446			-1,4	s
50	0,502	0,07	-0,1	-0,1	s
51	0,587			1,7	s
52	0,543	0,023	2,5	0,8	s

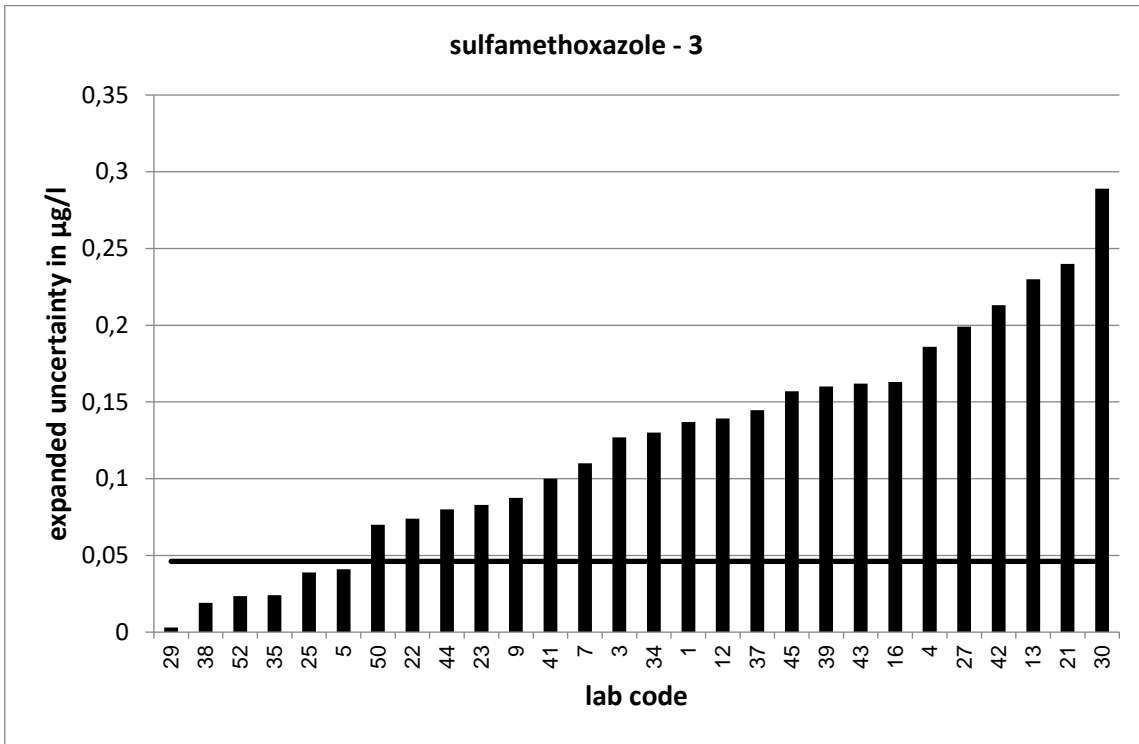
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory



Strongly deviating values are not shown in the diagram.





Strongly deviating values are not correctly shown in the diagram.



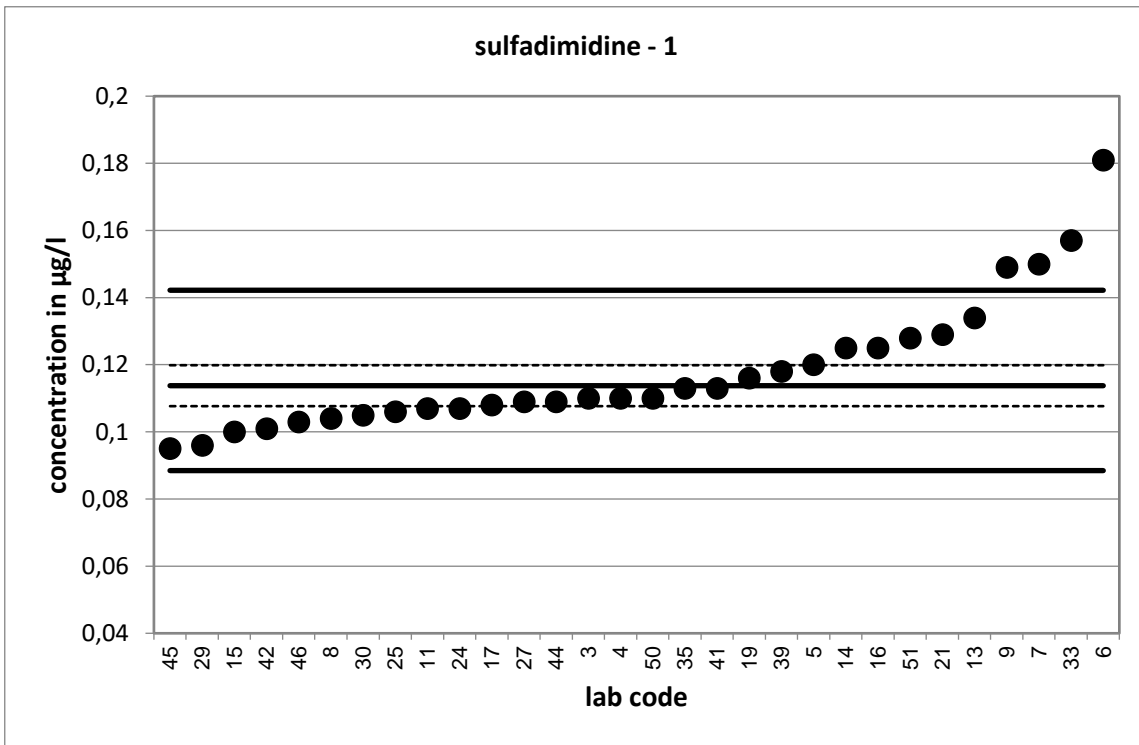
Strongly deviating values are not correctly shown in the diagram.



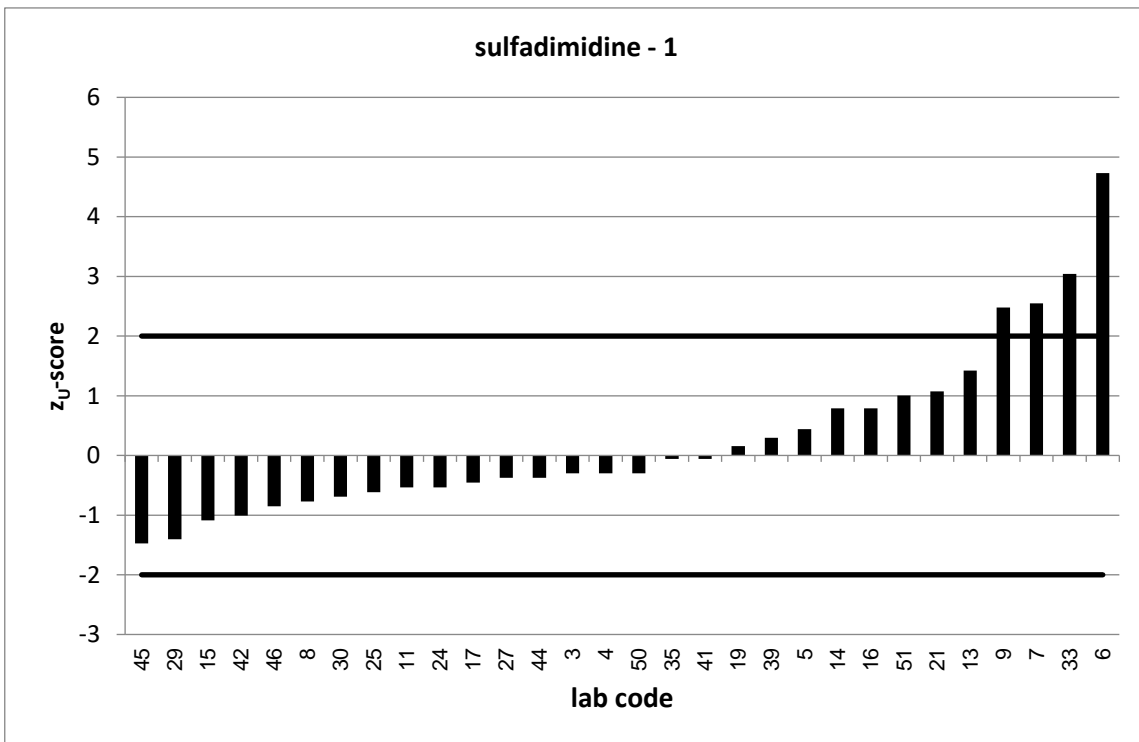
PT 4/23 - TW S2		sulfadimidine - 1			
assigned value [ $\mu\text{g/l}$ ]*		0,1138 $\pm$ 0,0061			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,1422			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,08846			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	$z_U$ -score	assessm.**
3	0,11	0,028	-0,3	-0,3	s
4	0,11	0,039	-0,2	-0,3	s
5	0,12	0,029	0,4	0,4	s
6	0,181			4,7	u
7	0,15	0,03	2,4	2,5	q
8	0,104			-0,8	s
9	0,149	0,036	1,9	2,5	q
11	0,107			-0,5	s
13	0,134	0,067	0,6	1,4	s
14	0,125			0,8	s
15	0,1			-1,1	s
16	0,125	0,023	0,9	0,8	s
17	0,108			-0,5	s
19	0,116			0,2	s
21	0,129	0,039	0,8	1,1	s
24	0,107			-0,5	s
25	0,106	0,009	-1,4	-0,6	s
27	0,109	0,047	-0,2	-0,4	s
29	0,096	0,001	-5,8	-1,4	s
30	0,105	0,031	-0,6	-0,7	s
33	0,157			3,0	u
35	0,113	0,006	-0,2	-0,1	s
39	0,118	0,038	0,2	0,3	s
41	0,113	0,04	0,0	-0,1	s
42	0,101	0,05	-0,5	-1,0	s
44	0,109	0,02	-0,5	-0,4	s
45	0,0951	0,029	-1,3	-1,5	s
46	0,103			-0,9	s
50	0,11	0,018	-0,4	-0,3	s
51	0,128			1,0	s

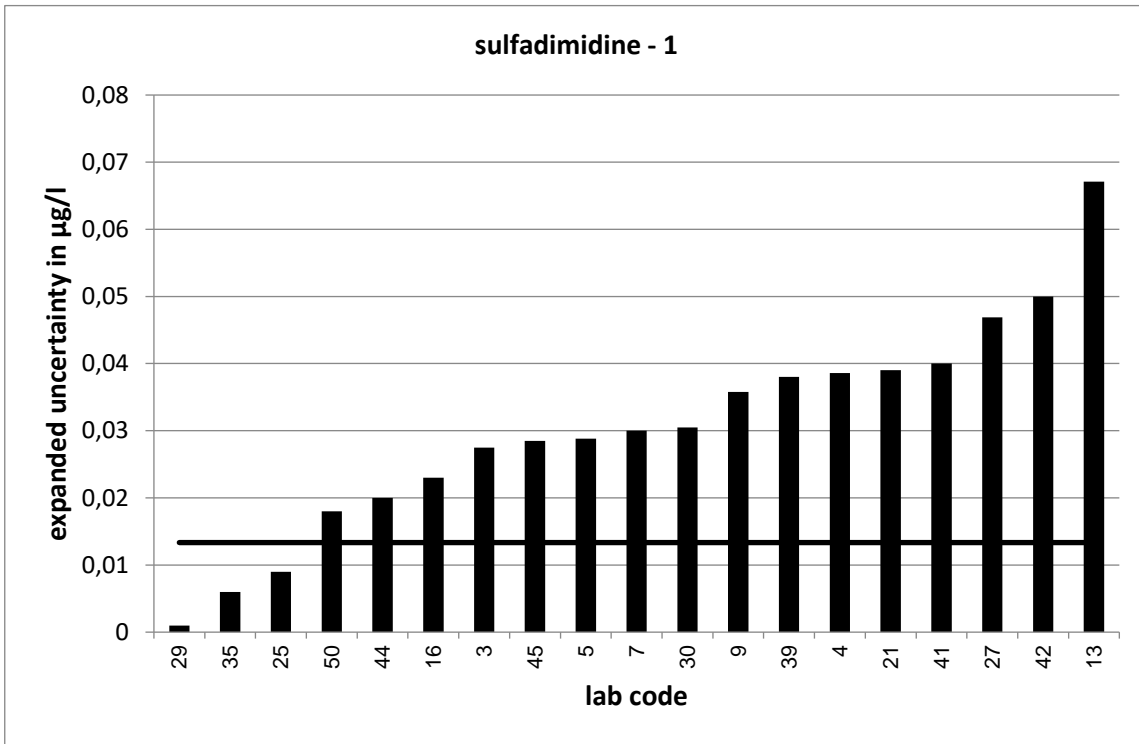
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

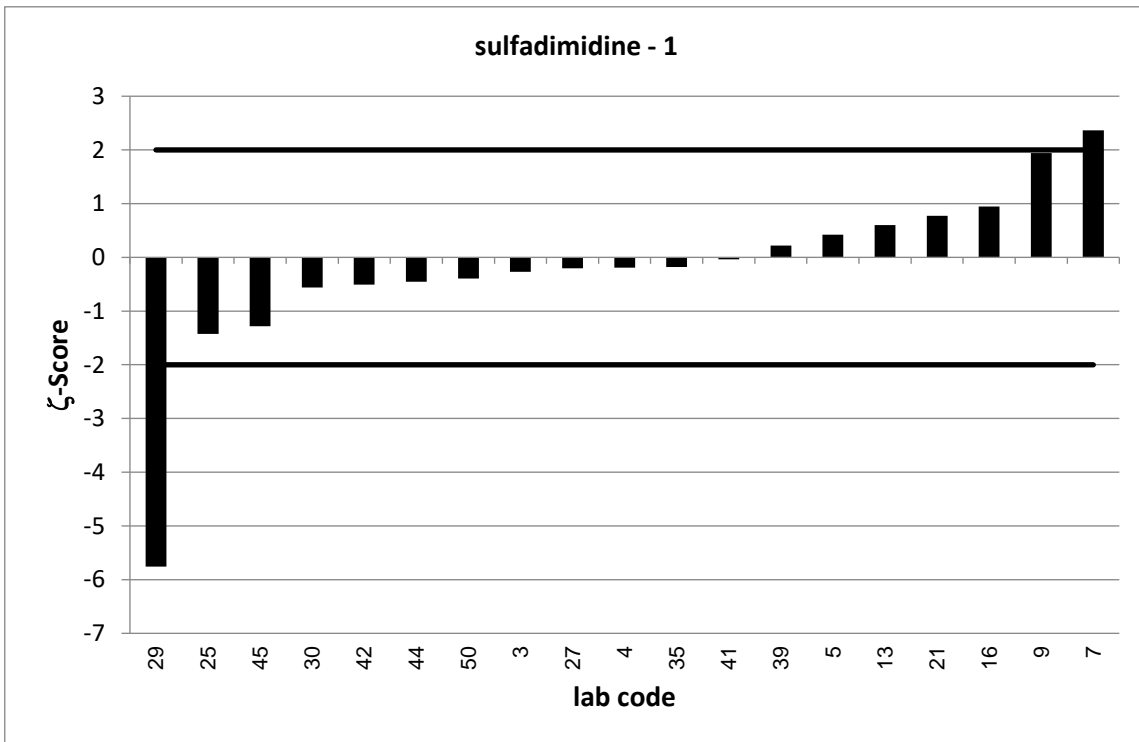


Strongly deviating values are not shown in the diagram.





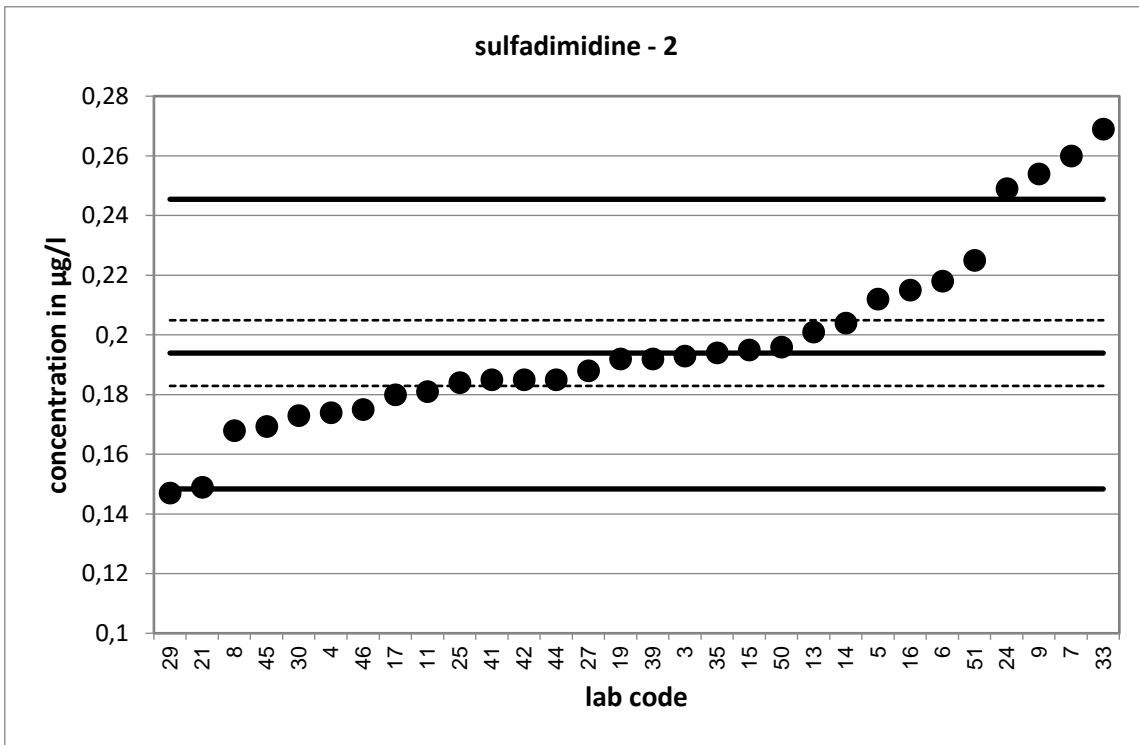
Strongly deviating values are not correctly shown in the diagram.



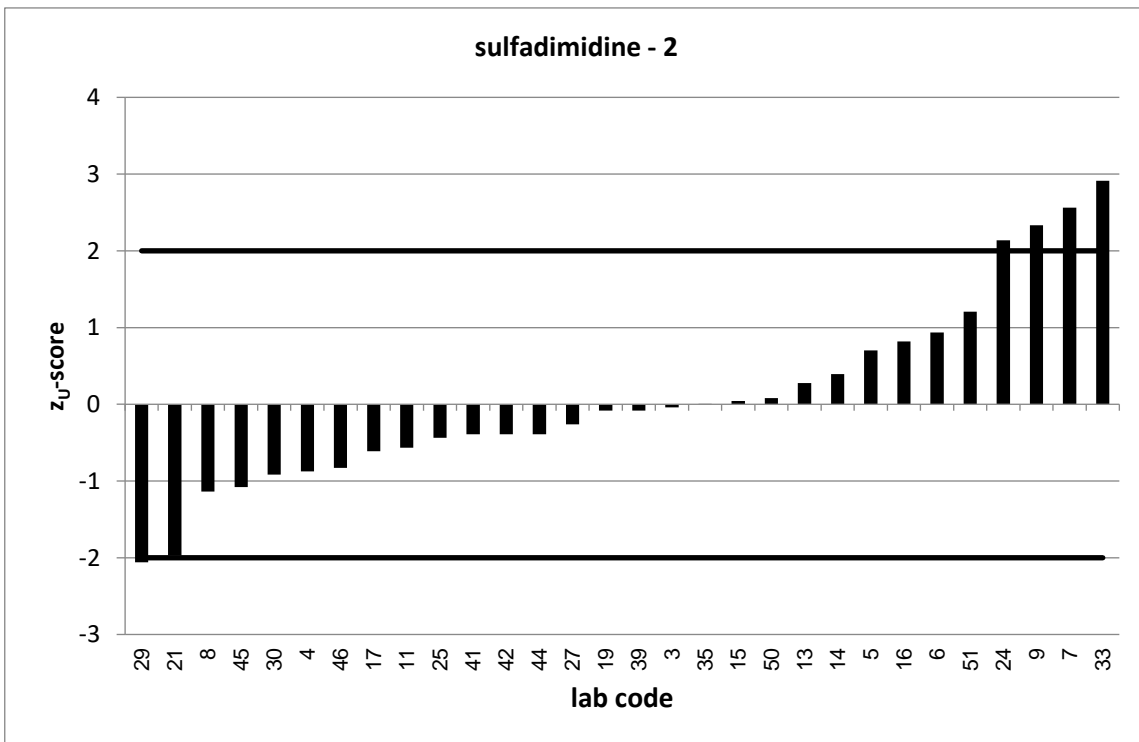
PT 4/23 - TW S2		sulfadimidine - 2			
assigned value [ $\mu\text{g/l}$ ]*		0,1939 $\pm$ 0,011			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,2454			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,1484			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	z <sub>U</sub> -score	assessm.**
3	0,193	0,048	0,0	0,0	s
4	0,174	0,061	-0,6	-0,9	s
5	0,212	0,509	0,1	0,7	s
6	0,218			0,9	s
7	0,26	0,05	2,6	2,6	q
8	0,168			-1,1	s
9	0,254	0,061	1,9	2,3	q
11	0,181			-0,6	s
13	0,201	0,1	0,1	0,3	s
14	0,204			0,4	s
15	0,195			0,0	s
16	0,215	0,039	1,0	0,8	s
17	0,18			-0,6	s
19	0,192			-0,1	s
21	0,149	0,045	-1,9	-2,0	s
24	0,249			2,1	q
25	0,184	0,025	-0,7	-0,4	s
27	0,188	0,081	-0,1	-0,3	s
29	0,147	0,001	-8,5	-2,1	q
30	0,173	0,05	-0,8	-0,9	s
33	0,269			2,9	q
35	0,194	0,01	0,0	0,0	s
39	0,192	0,062	-0,1	-0,1	s
41	0,185	0,04	-0,4	-0,4	s
42	0,185	0,092	-0,2	-0,4	s
44	0,185	0,04	-0,4	-0,4	s
45	0,1693	0,051	-0,9	-1,1	s
46	0,175			-0,8	s
50	0,196	0,031	0,1	0,1	s
51	0,225			1,2	s

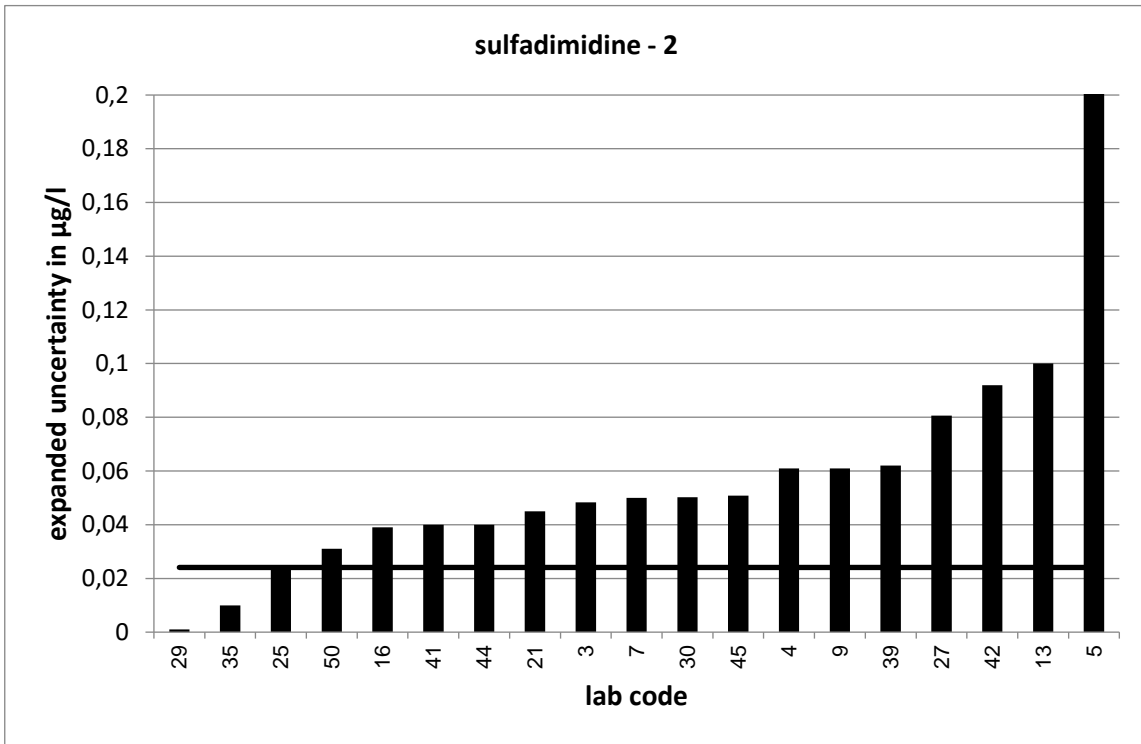
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

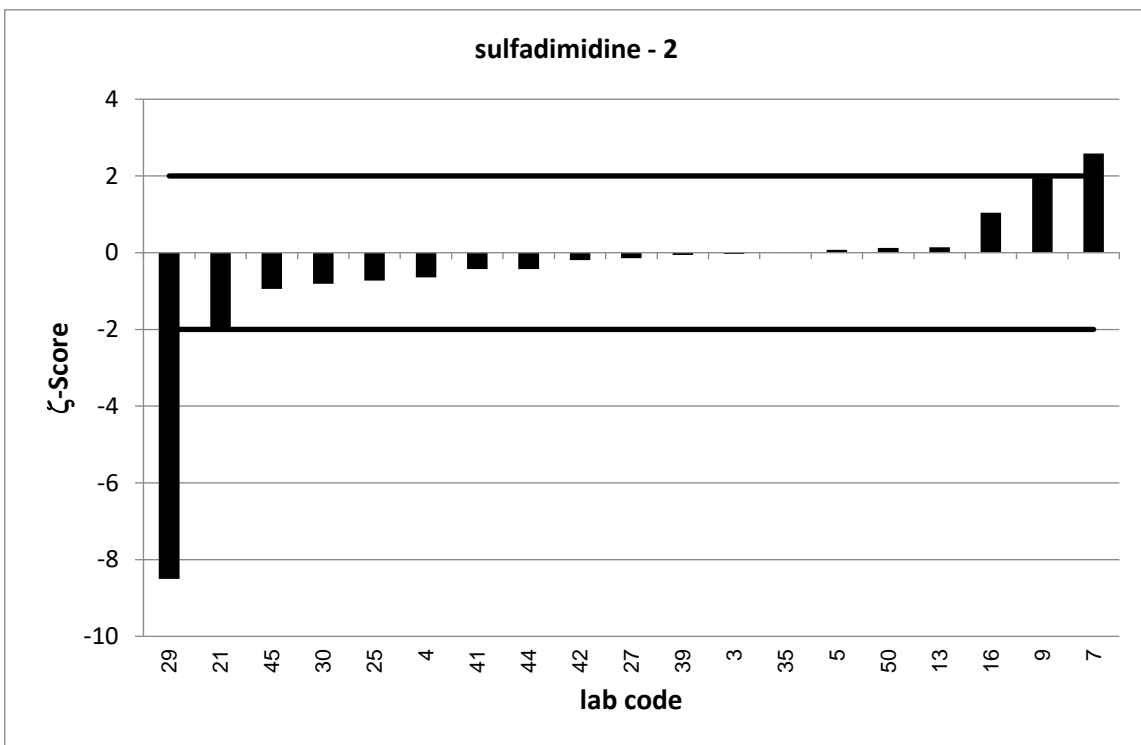


Strongly deviating values are not shown in the diagram.





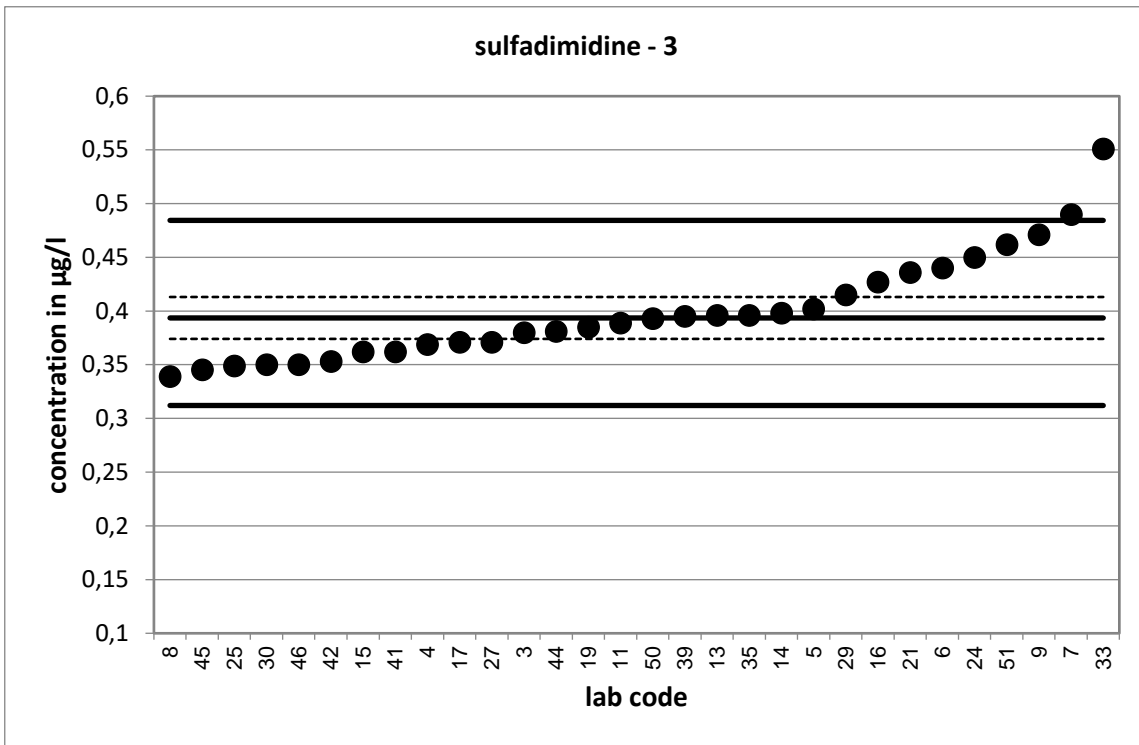
Strongly deviating values are not correctly shown in the diagram.



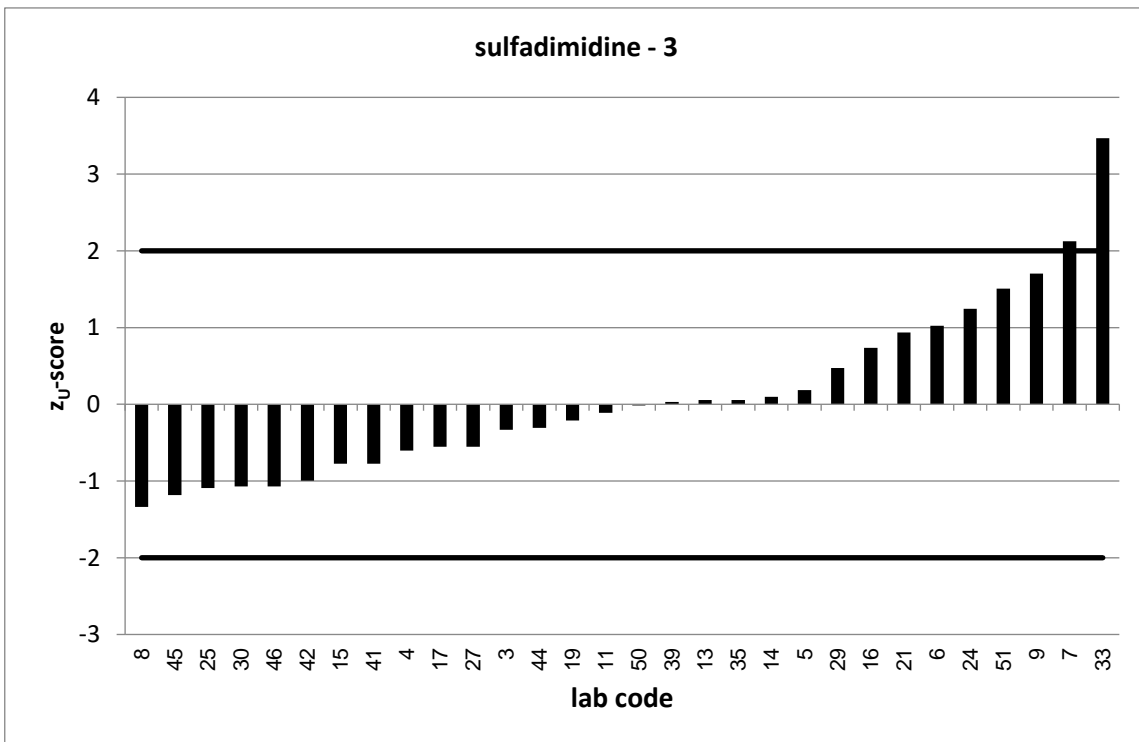
PT 4/23 - TW S2		sulfadimidine - 3			
assigned value [ $\mu\text{g/l}$ ]*		0,3936 $\pm$ 0,0195			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,4844			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,3121			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
3	0,38	0,095	-0,3	-0,3	s
4	0,369	0,129	-0,4	-0,6	s
5	0,402	0,097	0,2	0,2	s
6	0,44			1,0	s
7	0,49	0,1	1,9	2,1	q
8	0,339			-1,3	s
9	0,471	0,113	1,4	1,7	s
11	0,389			-0,1	s
13	0,396	0,198	0,0	0,1	s
14	0,398			0,1	s
15	0,362			-0,8	s
16	0,427	0,077	0,8	0,7	s
17	0,371			-0,6	s
19	0,385			-0,2	s
21	0,436	0,131	0,6	0,9	s
24	0,45			1,2	s
25	0,349	0,028	-2,6	-1,1	s
27	0,371	0,159	-0,3	-0,6	s
29	0,415	0,001	2,2	0,5	s
30	0,35	0,102	-0,8	-1,1	s
33	0,551			3,5	u
35	0,396	0,01	0,2	0,1	s
39	0,395	0,128	0,0	0,0	s
41	0,362	0,06	-1,0	-0,8	s
42	0,353	0,176	-0,5	-1,0	s
44	0,381	0,08	-0,3	-0,3	s
45	0,3454	0,104	-0,9	-1,2	s
46	0,35			-1,1	s
50	0,393	0,063	0,0	0,0	s
51	0,462			1,5	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

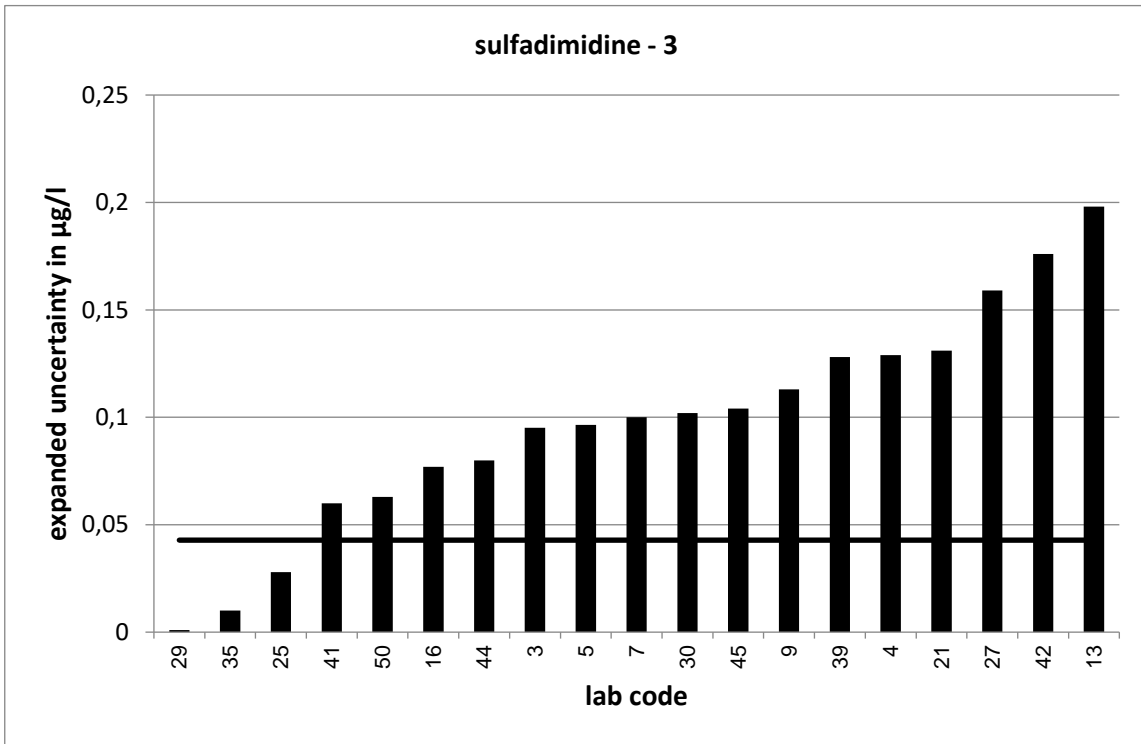
\*\* s = satisfactory, q = questionable, u = unsatisfactory



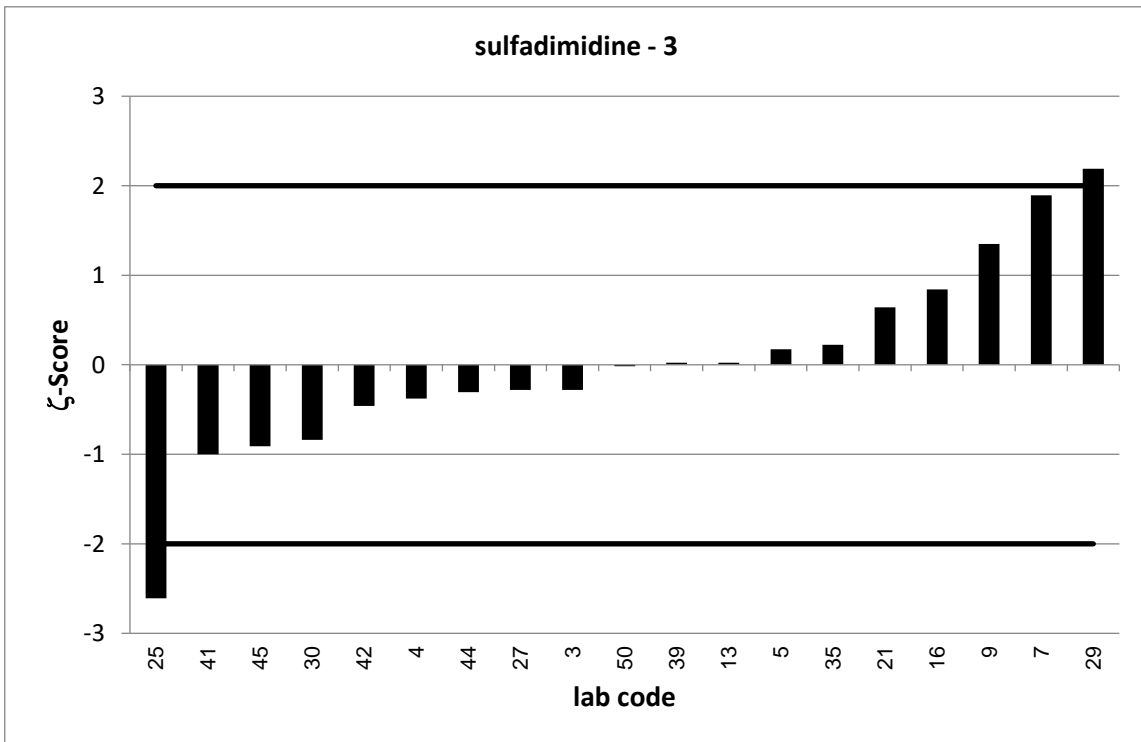
Strongly deviating values are not shown in the diagram.







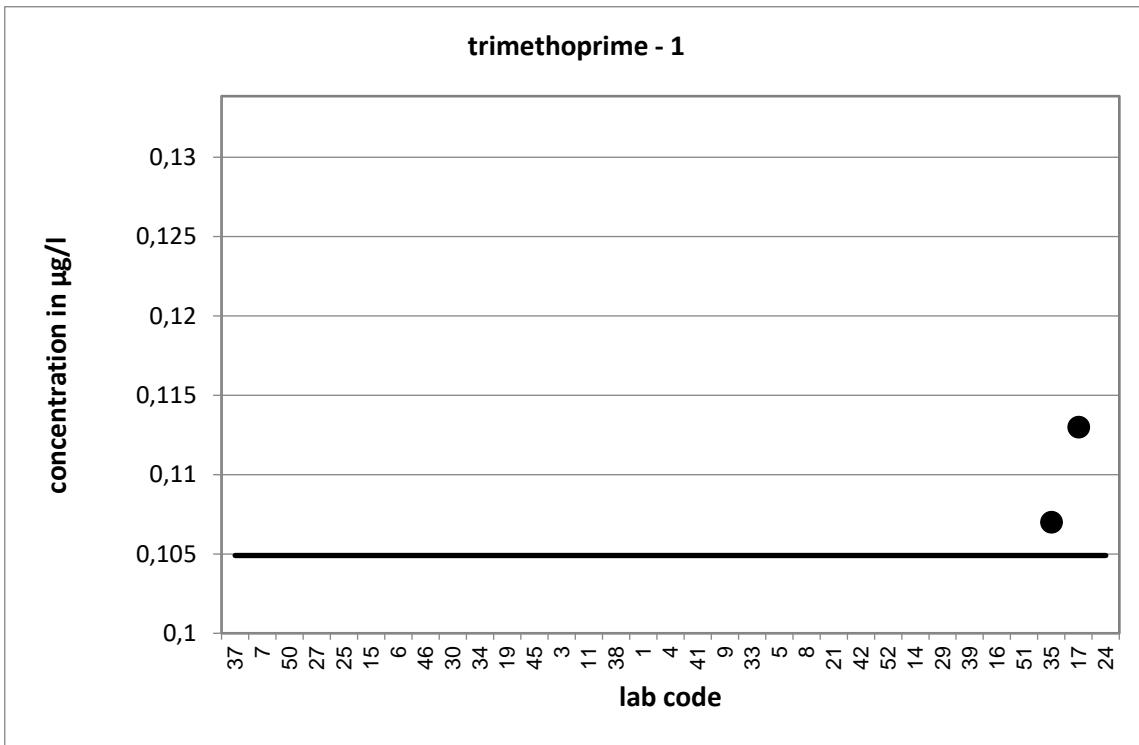
Strongly deviating values are not correctly shown in the diagram.



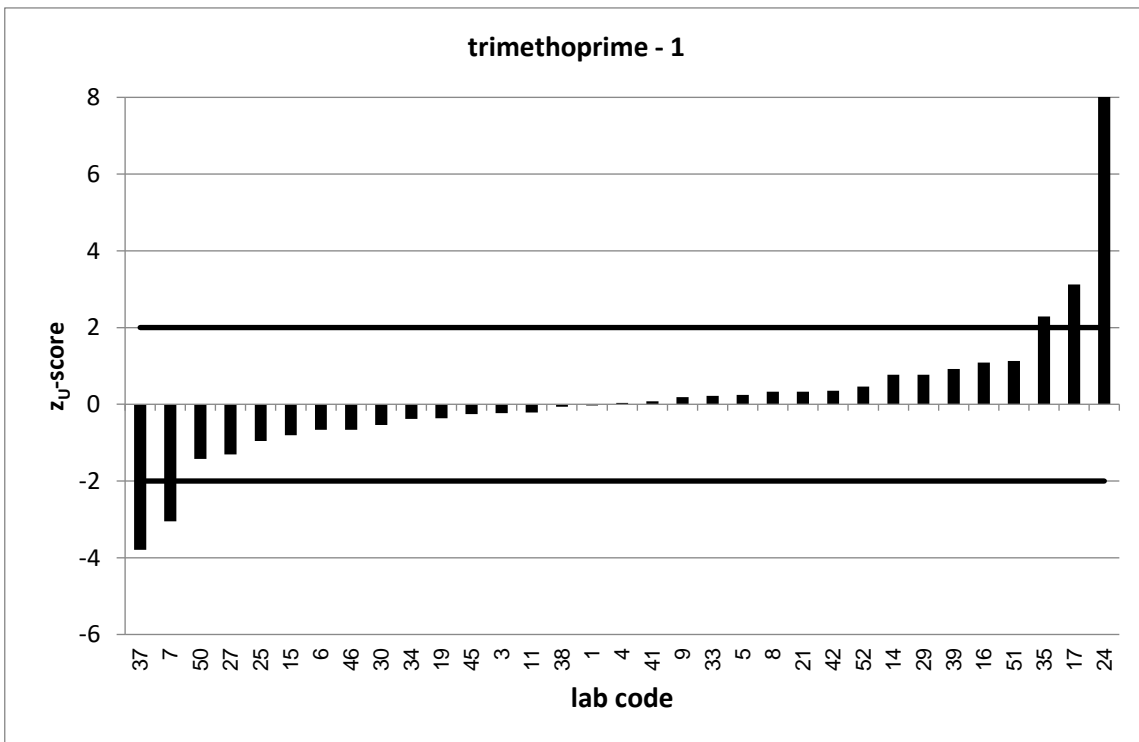
PT 4/23 - TW S2		trimethoprim - 1			
assigned value [ $\mu\text{g/l}$ ]*		0,09043 $\pm$ 0,00302			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,1049			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,07703			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	z <sub>U</sub> -score	assessm.**
1	0,0902			0,0	s
3	0,0889	0,022	-0,1	-0,2	s
4	0,0907	0,032	0,0	0,0	s
5	0,0922	0,03	0,1	0,2	s
6	0,086			-0,7	s
7	0,07	0,01	-3,9	-3,0	u
8	0,0928			0,3	s
9	0,0918	0,01	0,3	0,2	s
11	0,089			-0,2	s
14	0,096			0,8	s
15	0,085			-0,8	s
16	0,0983	0,016	1,0	1,1	s
17	0,113			3,1	u
19	0,088			-0,4	s
21	0,0928	0,028	0,2	0,3	s
24	0,598			70,1	u
25	0,084	0,002	-3,5	-1,0	s
27	0,0817	0,035	-0,5	-1,3	s
29	0,096	0,005	1,9	0,8	s
30	0,0868	0,025	-0,3	-0,5	s
33	0,092			0,2	s
34	0,0879	0,022	-0,2	-0,4	s
35	0,107	0,009	3,5	2,3	q
37	0,065	0,02	-2,6	-3,8	u
38	0,09	0,004	-0,2	-0,1	s
39	0,0971	0,029	0,5	0,9	s
41	0,091	0,02	0,1	0,1	s
42	0,093	0,033	0,2	0,4	s
45	0,0887	0,027	-0,1	-0,3	s
46	0,086			-0,7	s
50	0,0809	0,025	-0,8	-1,4	s
51	0,0986			1,1	s
52	0,0938	0,01	0,6	0,5	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

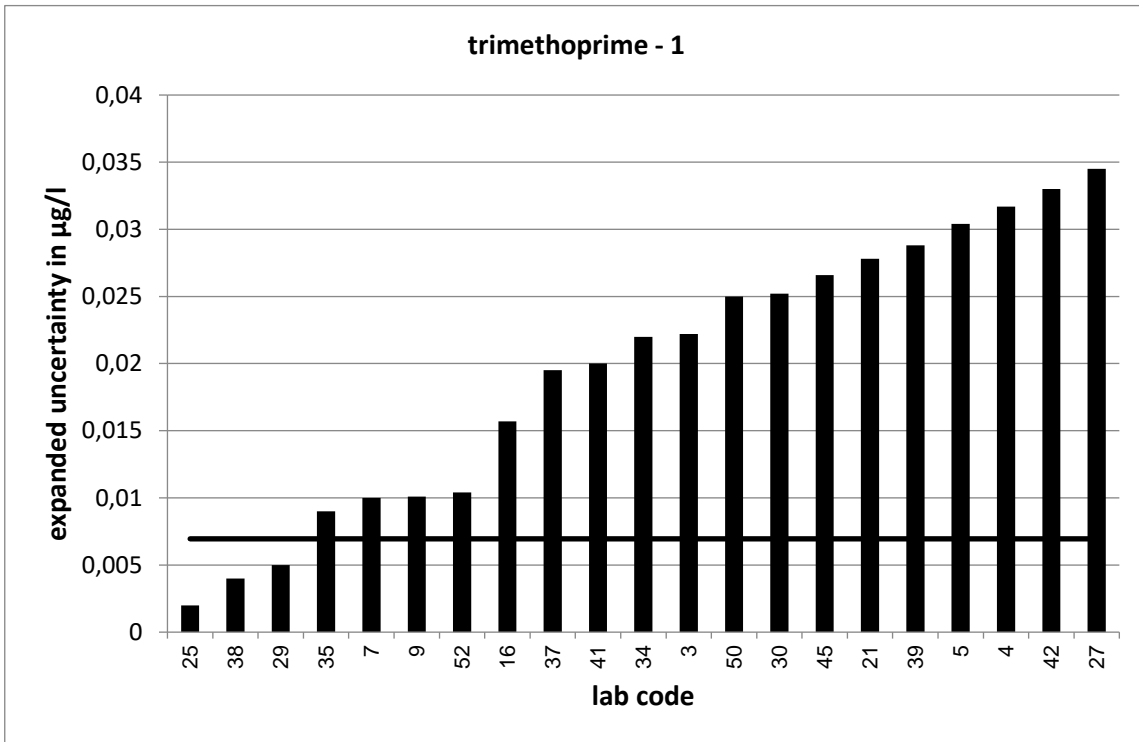
\*\* s = satisfactory, q = questionable, u = unsatisfactory



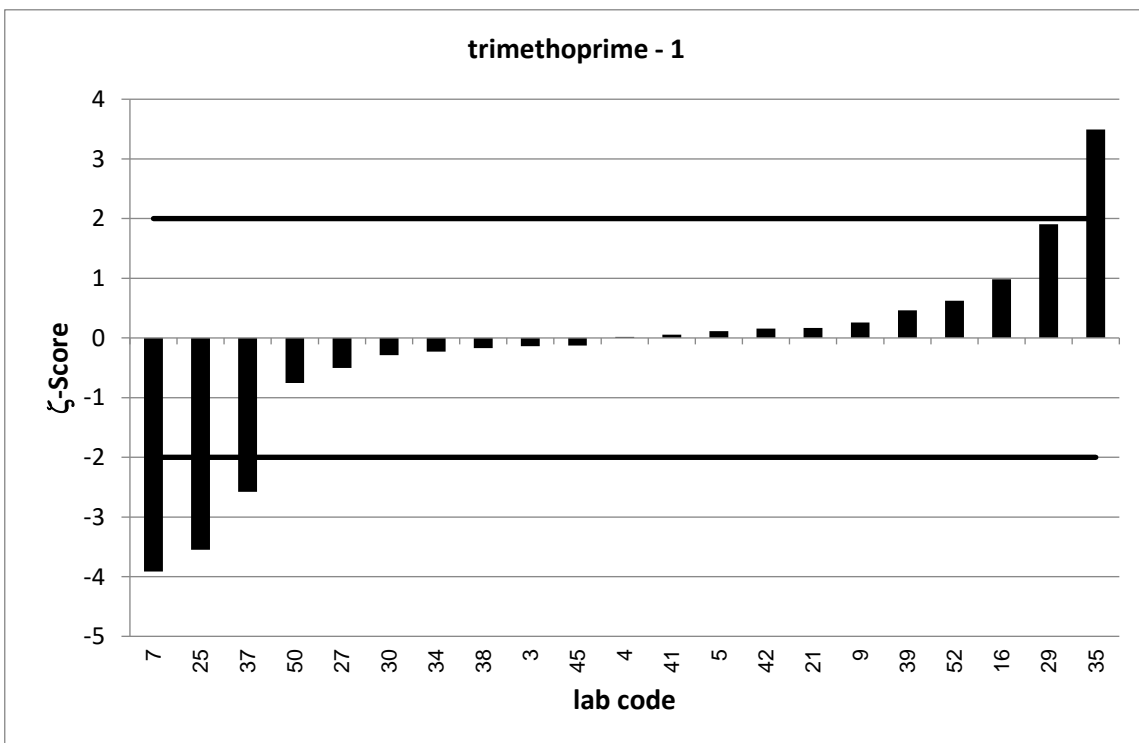
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



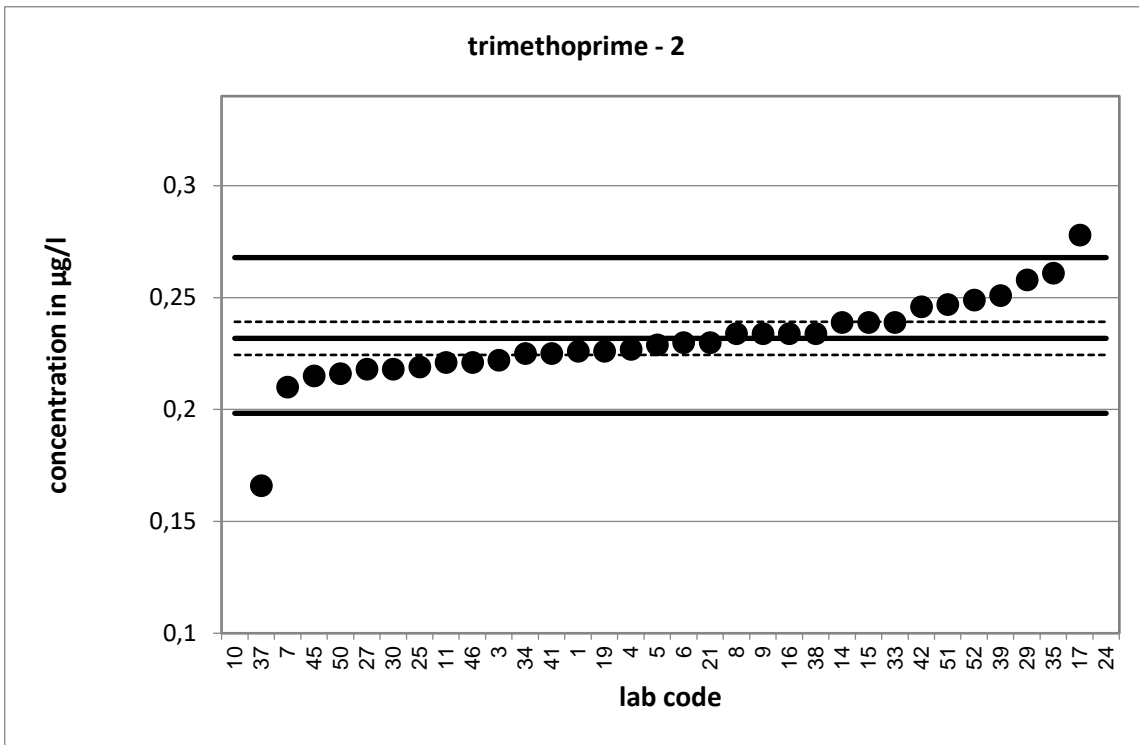
Strongly deviating values are not correctly shown in the diagram.



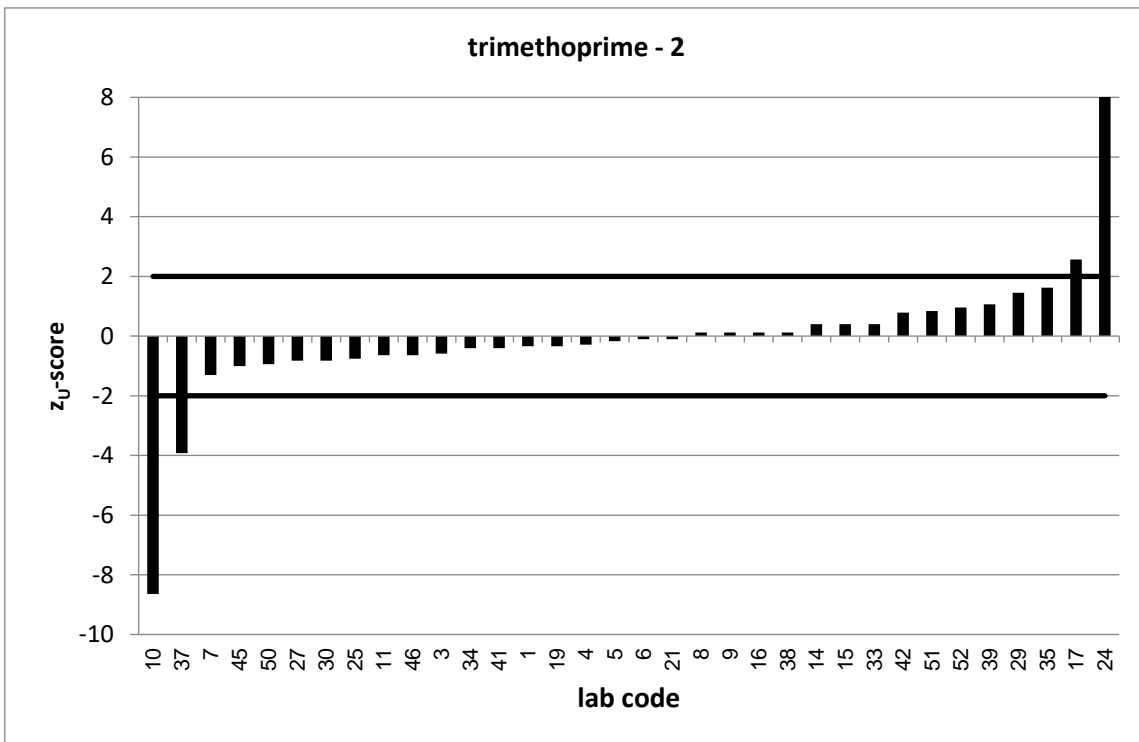
PT 4/23 - TW S2		trimethoprim - 2			
assigned value [ $\mu\text{g/l}$ ]*		0,2318 $\pm$ 0,0074			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,2679			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,1983			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	$z_U$ -score	assessm.**
1	0,226			-0,3	s
3	0,222	0,056	-0,3	-0,6	s
4	0,227	0,079	-0,1	-0,3	s
5	0,229	0,076	-0,1	-0,2	s
6	0,23			-0,1	s
7	0,21	0,04	-1,1	-1,3	s
8	0,234			0,1	s
9	0,234	0,026	0,2	0,1	s
10	0,087	0,026	-10,7	-8,6	u
11	0,221			-0,6	s
14	0,239			0,4	s
15	0,239			0,4	s
16	0,234	0,038	0,1	0,1	s
17	0,278			2,6	q
19	0,226			-0,3	s
21	0,23	0,069	-0,1	-0,1	s
24	1,757			84,5	u
25	0,219	0,004	-3,0	-0,8	s
27	0,218	0,092	-0,3	-0,8	s
29	0,258	0,005	5,9	1,5	s
30	0,218	0,063	-0,4	-0,8	s
33	0,239			0,4	s
34	0,225	0,056	-0,2	-0,4	s
35	0,261	0,052	1,1	1,6	s
37	0,166	0,05	-2,6	-3,9	u
38	0,234	0,01	0,4	0,1	s
39	0,251	0,074	0,5	1,1	s
41	0,225	0,04	-0,3	-0,4	s
42	0,246	0,09	0,3	0,8	s
45	0,215	0,064	-0,5	-1,0	s
46	0,221			-0,6	s
50	0,216	0,067	-0,5	-0,9	s
51	0,247			0,8	s
52	0,249	0,01	2,8	1,0	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

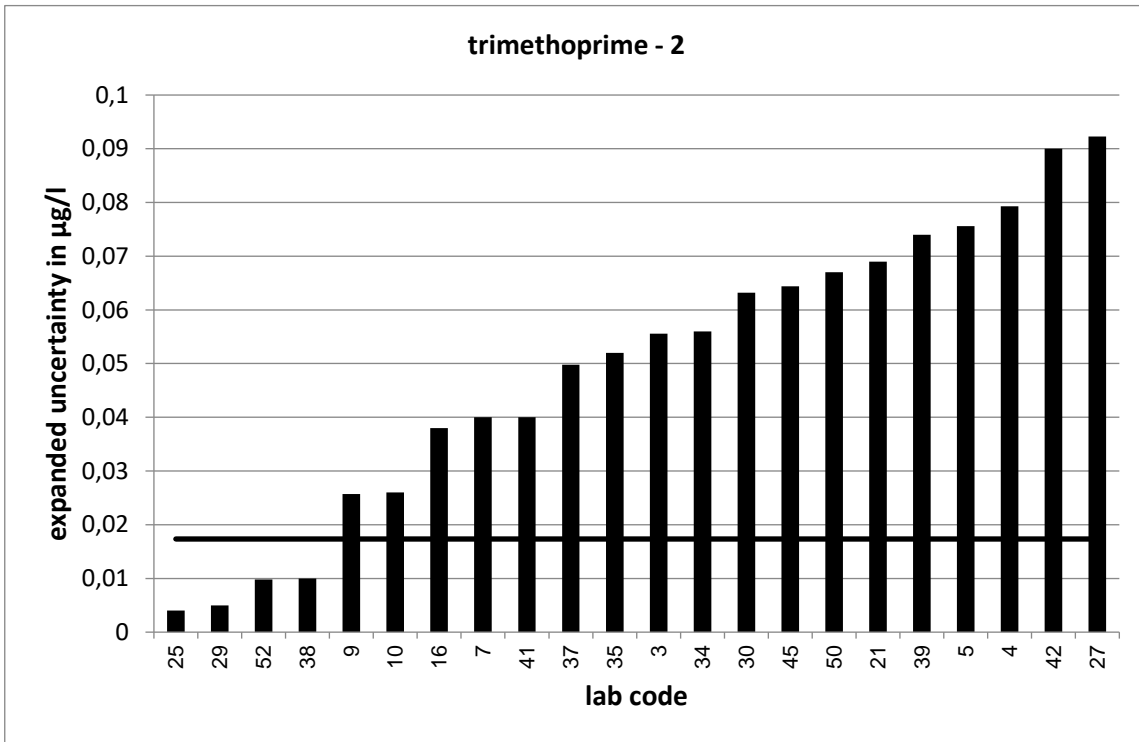
\*\* s = satisfactory, q = questionable, u = unsatisfactory



Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



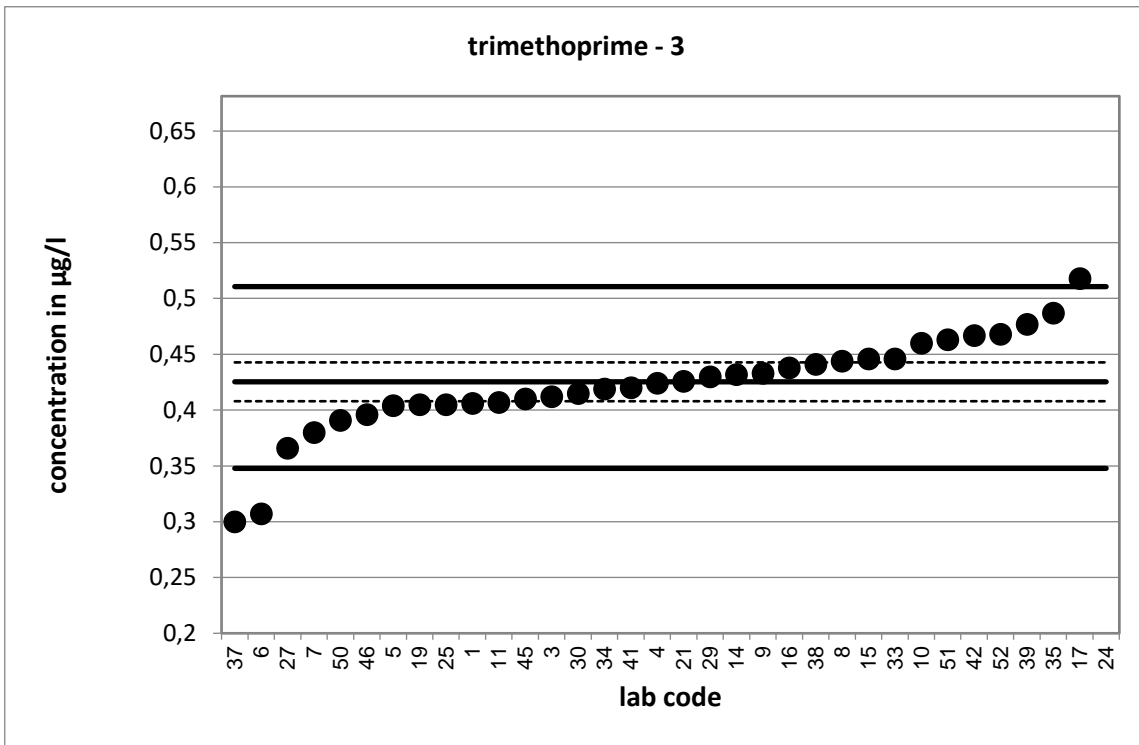
Strongly deviating values are not correctly shown in the diagram.

PT 4/23 - TW S2		trimethoprim - 3			
assigned value [ $\mu\text{g/l}$ ]*		0,4253 $\pm$ 0,0174			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,5106			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,3478			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,406			-0,5	s
3	0,412	0,103	-0,3	-0,3	s
4	0,424	0,149	0,0	0,0	s
5	0,404	0,133	-0,3	-0,6	s
6	0,307			-3,1	u
7	0,38	0,08	-1,1	-1,2	s
8	0,444			0,4	s
9	0,433	0,048	0,3	0,2	s
10	0,46	0,12	0,6	0,8	s
11	0,407			-0,5	s
14	0,432			0,2	s
15	0,446			0,5	s
16	0,438	0,07	0,4	0,3	s
17	0,518			2,2	q
19	0,405			-0,5	s
21	0,426	0,128	0,0	0,0	s
24	3,09			62,5	u
25	0,405	0,008	-2,1	-0,5	s
27	0,366	0,155	-0,8	-1,5	s
29	0,43	0,005	0,5	0,1	s
30	0,415	0,12	-0,2	-0,3	s
33	0,446			0,5	s
34	0,419	0,1	-0,1	-0,2	s
35	0,487	0,051	2,3	1,4	s
37	0,3	0,09	-2,7	-3,2	u
38	0,441	0,019	1,2	0,4	s
39	0,477	0,141	0,7	1,2	s
41	0,42	0,06	-0,2	-0,1	s
42	0,467	0,169	0,5	1,0	s
45	0,41	0,123	-0,2	-0,4	s
46	0,396			-0,8	s
50	0,391	0,121	-0,6	-0,9	s
51	0,463			0,9	s
52	0,468	0,017	3,5	1,0	s

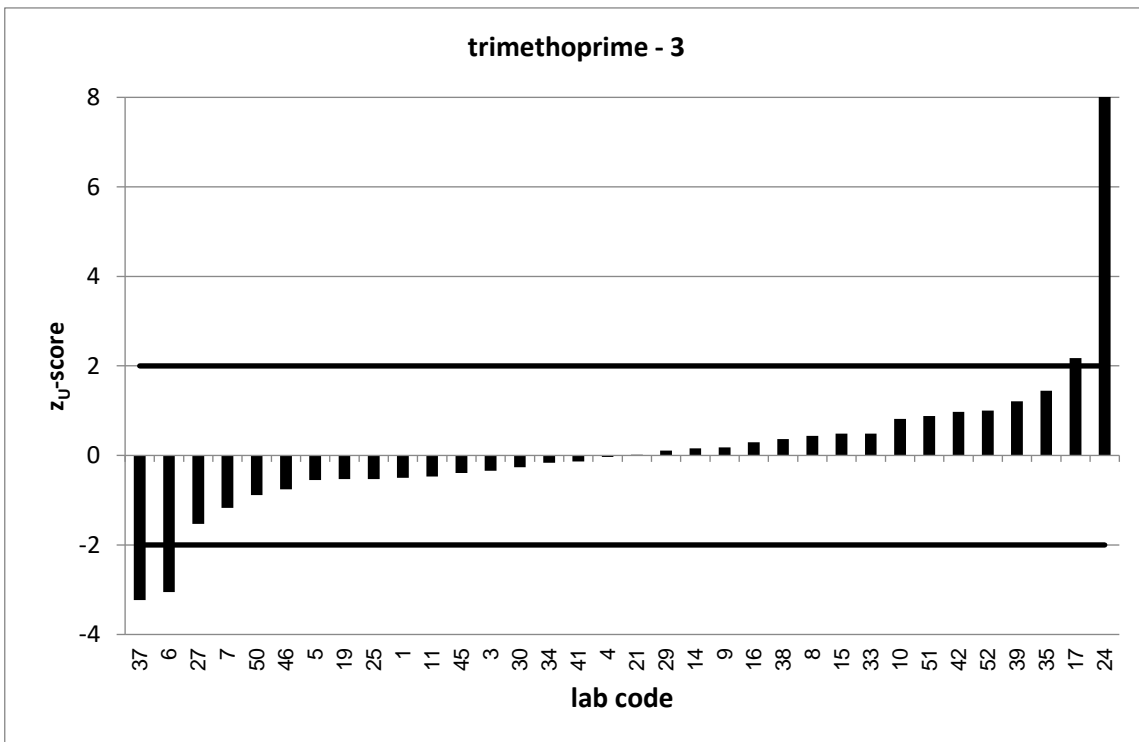
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

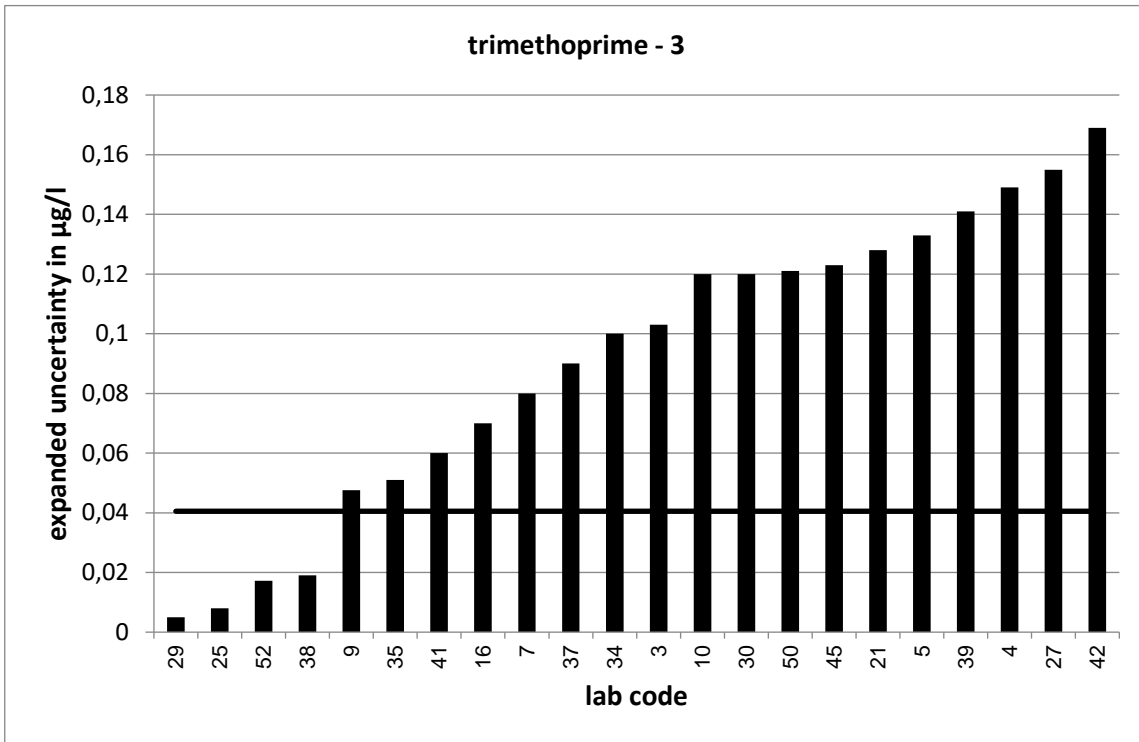




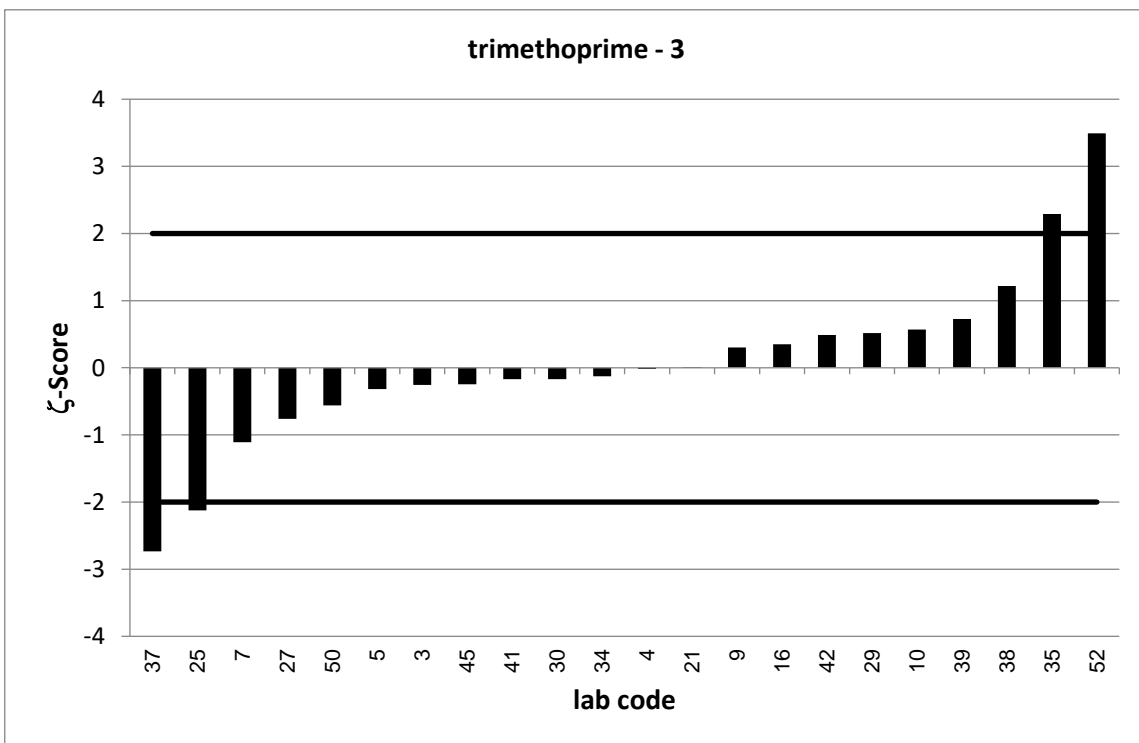
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



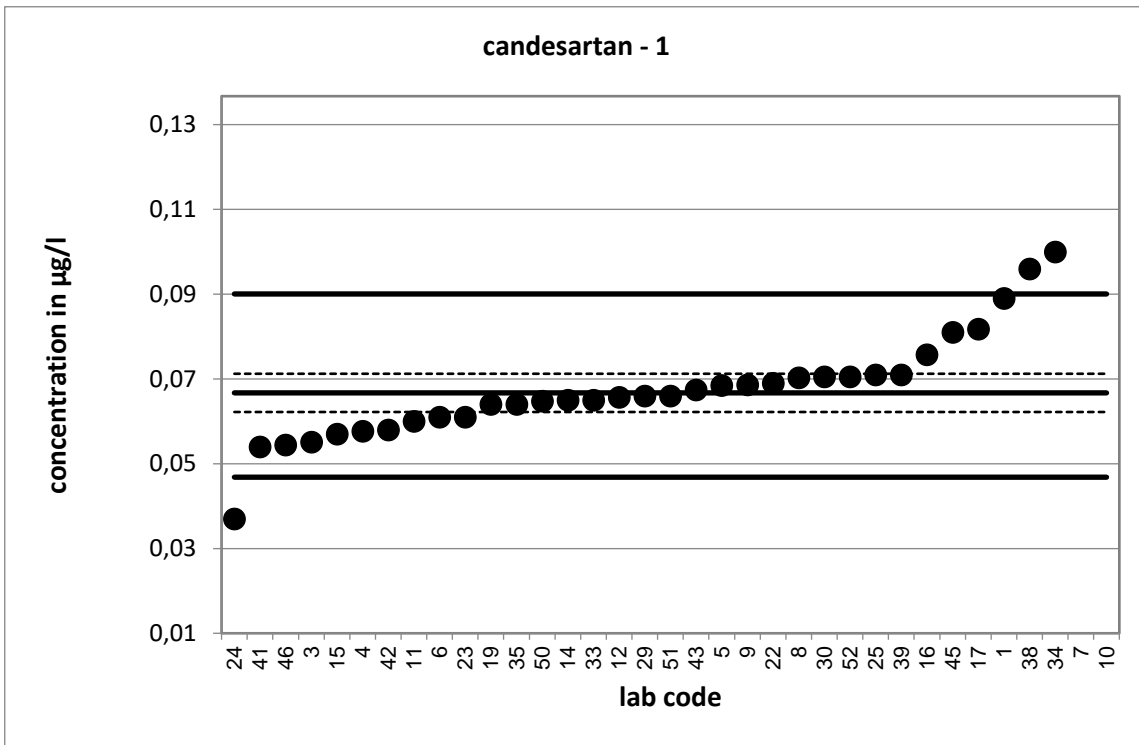
Strongly deviating values are not correctly shown in the diagram.



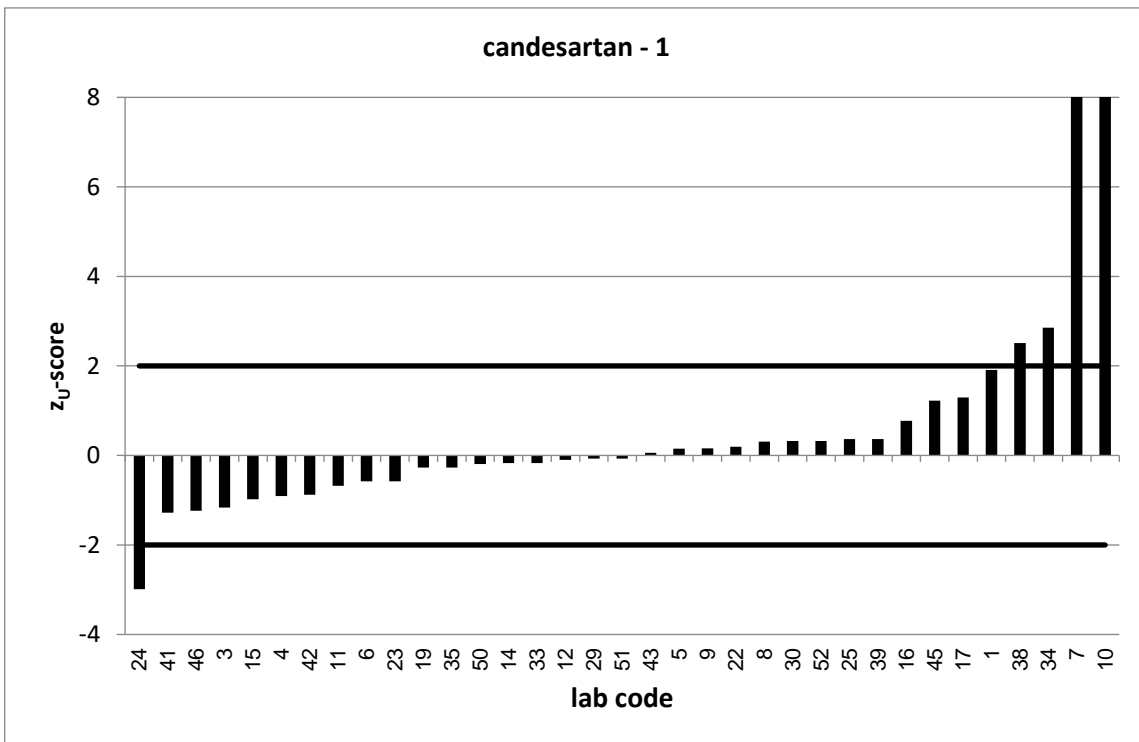
PT 4/23 - TW S2		candesartan - 1			
assigned value [ $\mu\text{g/l}$ ]*		0,06671	$\pm 0,00451$		
upper tolerance limit [ $\mu\text{g/l}$ ]		0,09004			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,04682			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	$z_U$ -score	assessm.**
1	0,089	0,036	1,2	1,9	s
3	0,0551	0,014	-1,6	-1,2	s
4	0,0577	0,02	-0,9	-0,9	s
5	0,0685	0,018	0,2	0,2	s
6	0,061			-0,6	s
7	0,21	0,04	7,1	12,3	u
8	0,0703			0,3	s
9	0,0686	0,014	0,2	0,2	s
10	0,3	0,06	7,8	20,0	u
11	0,06			-0,7	s
12	0,0657	0,006	-0,3	-0,1	s
14	0,065			-0,2	s
15	0,057			-1,0	s
16	0,0757	0,043	0,4	0,8	s
17	0,0818			1,3	s
19	0,064			-0,3	s
22	0,069	0,01	0,4	0,2	s
23	0,061	0,013	-0,8	-0,6	s
24	0,037			-3,0	u
25	0,071	0,001	1,9	0,4	s
29	0,066	0,002	-0,3	-0,1	s
30	0,0705	0,02	0,4	0,3	s
33	0,065			-0,2	s
34	0,1	0,025	2,6	2,9	q
35	0,064	0,004	-0,9	-0,3	s
38	0,096	0,004	9,7	2,5	q
39	0,071	0,025	0,3	0,4	s
41	0,054	0,02	-1,2	-1,3	s
42	0,058	0,039	-0,4	-0,9	s
43	0,0674	0,014	0,1	0,1	s
45	0,081	0,024	1,2	1,2	s
46	0,0544			-1,2	s
50	0,0648	0,009	-0,4	-0,2	s
51	0,066			-0,1	s
52	0,0705	0,017	0,4	0,3	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

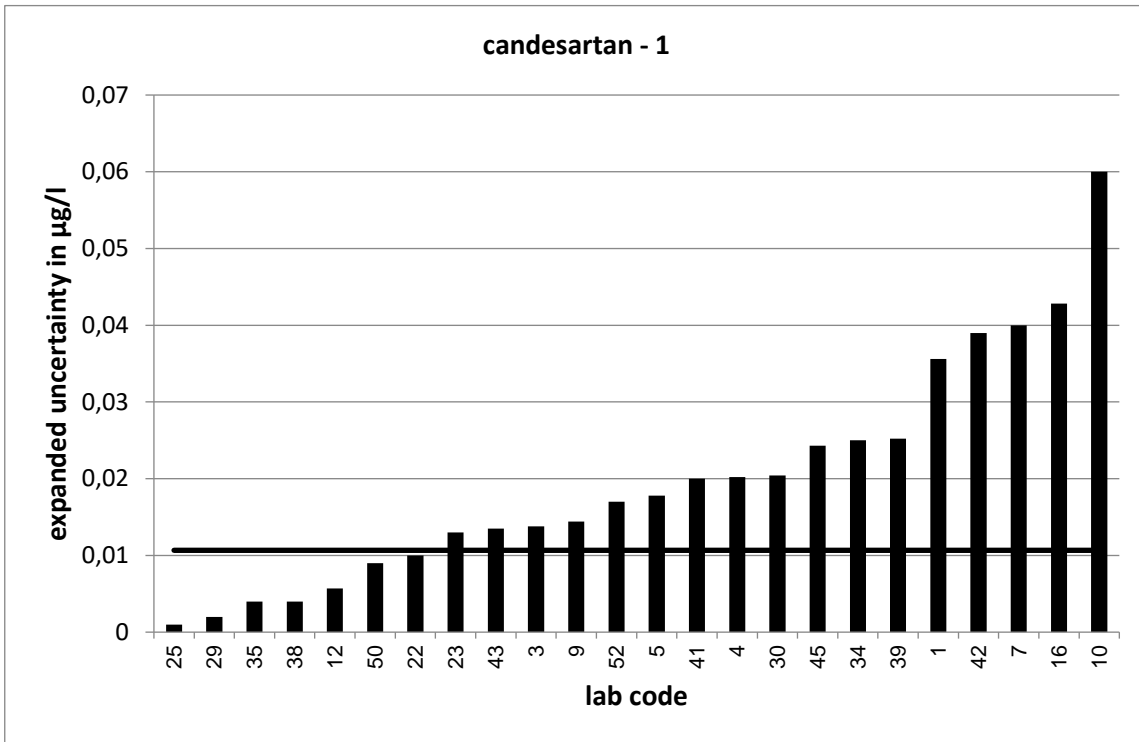
\*\* s = satisfactory, q = questionable, u = unsatisfactory



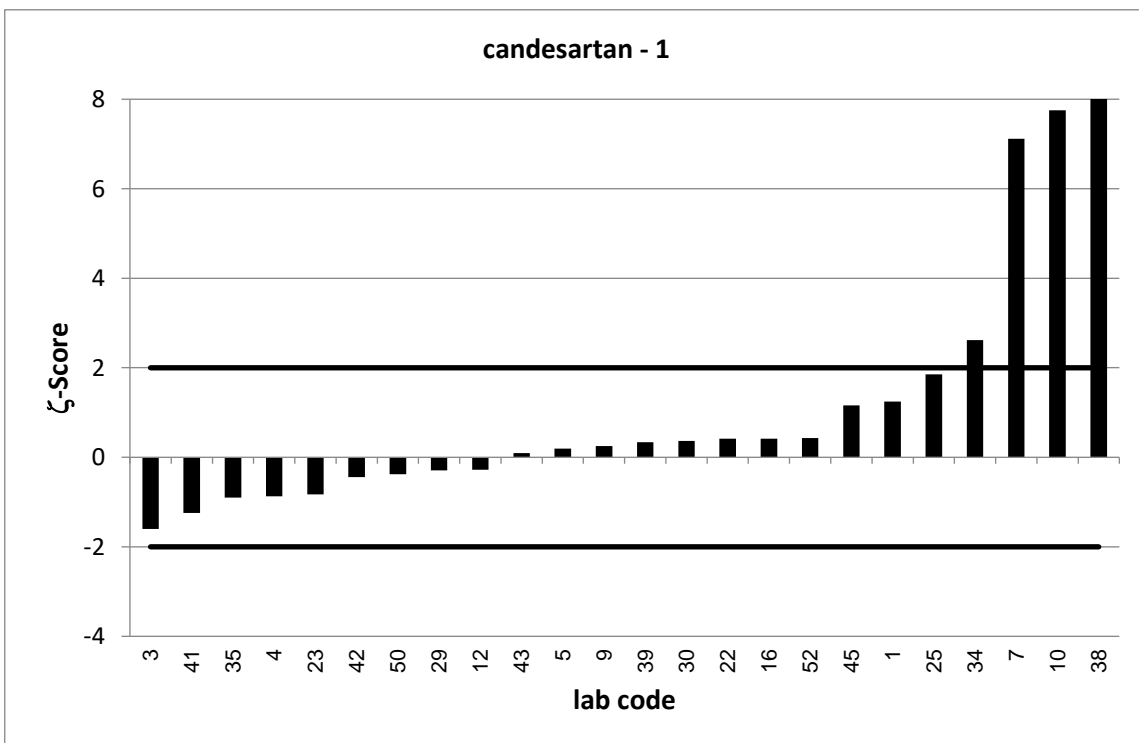
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.

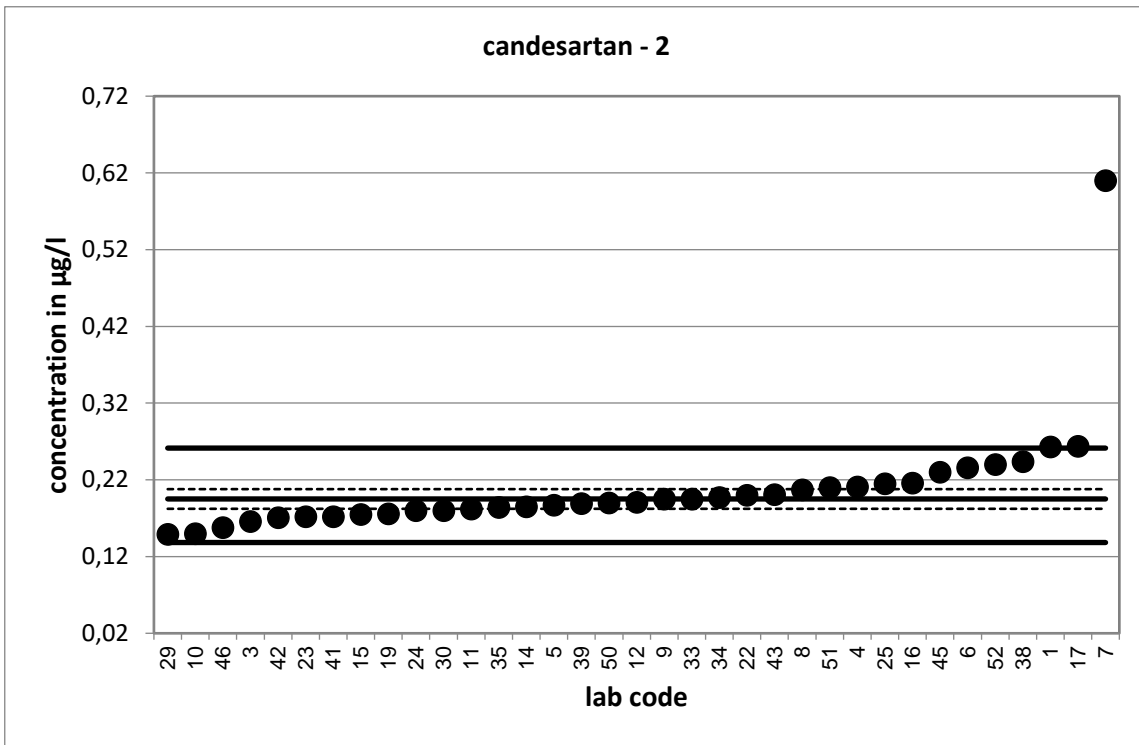


Strongly deviating values are not correctly shown in the diagram.

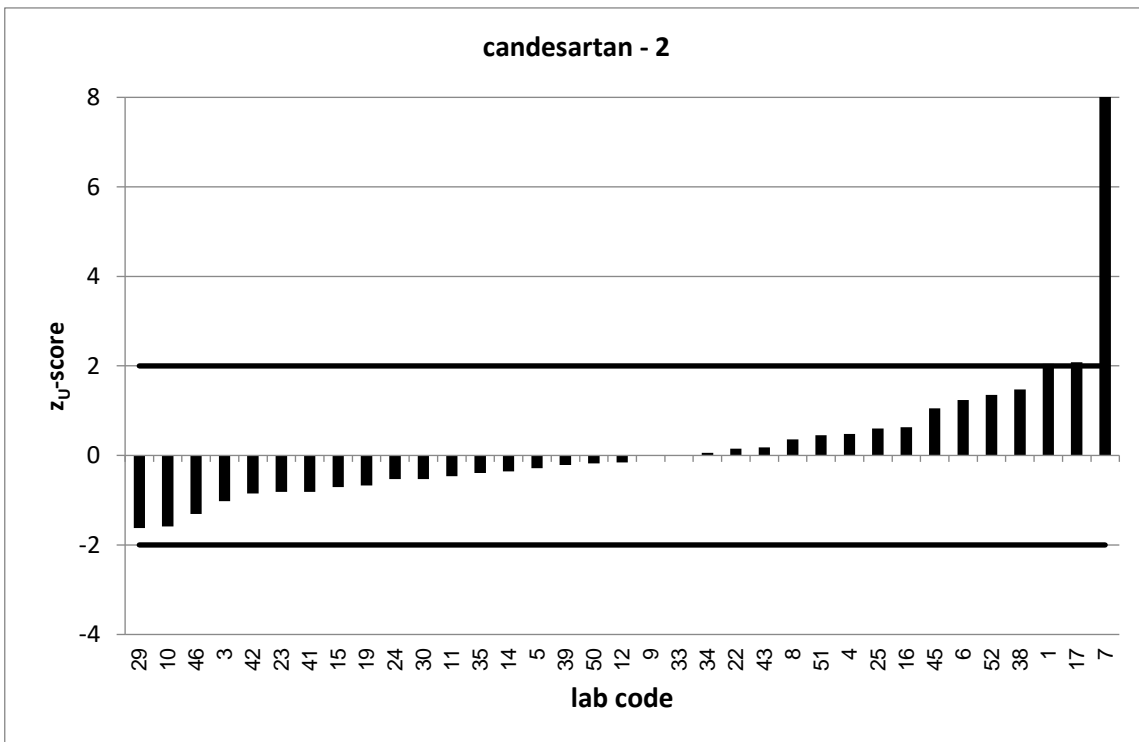
PT 4/23 - TW S2		candesartan - 2			
assigned value [ $\mu\text{g/l}$ ]*		0,1951 $\pm$ 0,0128			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,2614			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,1383			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	$z_U$ -score	assessm.**
1	0,263	0,105	1,3	2,0	s
3	0,166	0,042	-1,3	-1,0	s
4	0,211	0,074	0,4	0,5	s
5	0,187	0,049	-0,3	-0,3	s
6	0,236			1,2	s
7	0,61	0,12	6,9	12,5	u
8	0,207			0,4	s
9	0,195	0,041	0,0	0,0	s
10	0,15	0,045	-1,9	-1,6	s
11	0,182			-0,5	s
12	0,1907	0,017	-0,4	-0,2	s
14	0,185			-0,4	s
15	0,175			-0,7	s
16	0,216	0,122	0,3	0,6	s
17	0,264			2,1	q
19	0,176			-0,7	s
22	0,2	0,03	0,3	0,1	s
23	0,172	0,038	-1,1	-0,8	s
24	0,18			-0,5	s
25	0,215	0,016	1,9	0,6	s
29	0,149	0,002	-7,1	-1,6	s
30	0,18	0,052	-0,6	-0,5	s
33	0,195			0,0	s
34	0,197	0,049	0,1	0,1	s
35	0,184	0,016	-1,1	-0,4	s
38	0,244	0,011	5,8	1,5	s
39	0,189	0,067	-0,2	-0,2	s
41	0,172	0,06	-0,8	-0,8	s
42	0,171	0,114	-0,4	-0,8	s
43	0,201	0,04	0,3	0,2	s
45	0,23	0,069	1,0	1,1	s
46	0,158			-1,3	s
50	0,19	0,027	-0,3	-0,2	s
51	0,21			0,5	s
52	0,24	0,012	5,1	1,4	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

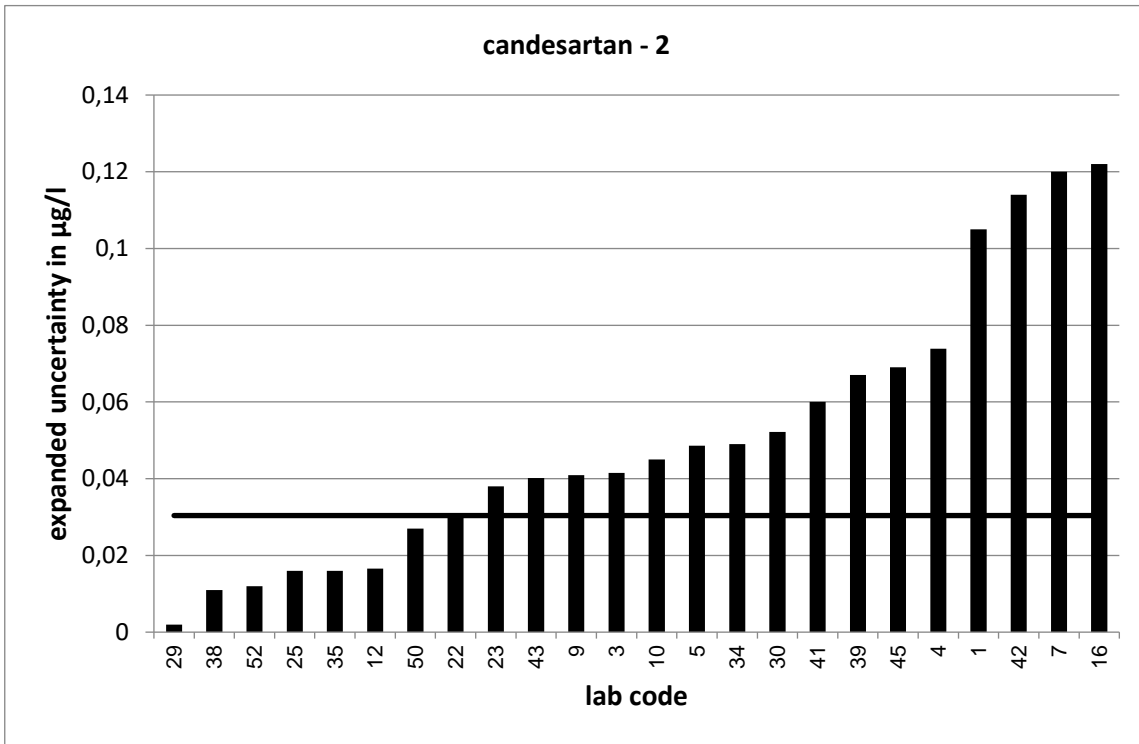
\*\* s = satisfactory, q = questionable, u = unsatisfactory



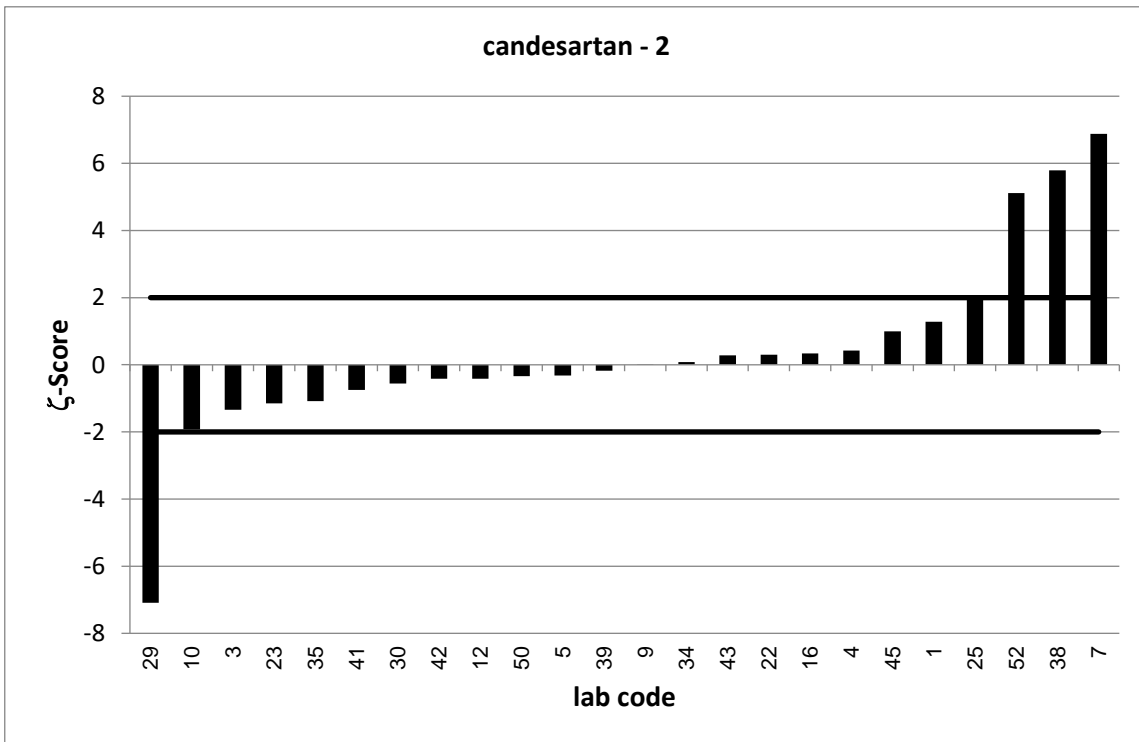
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.

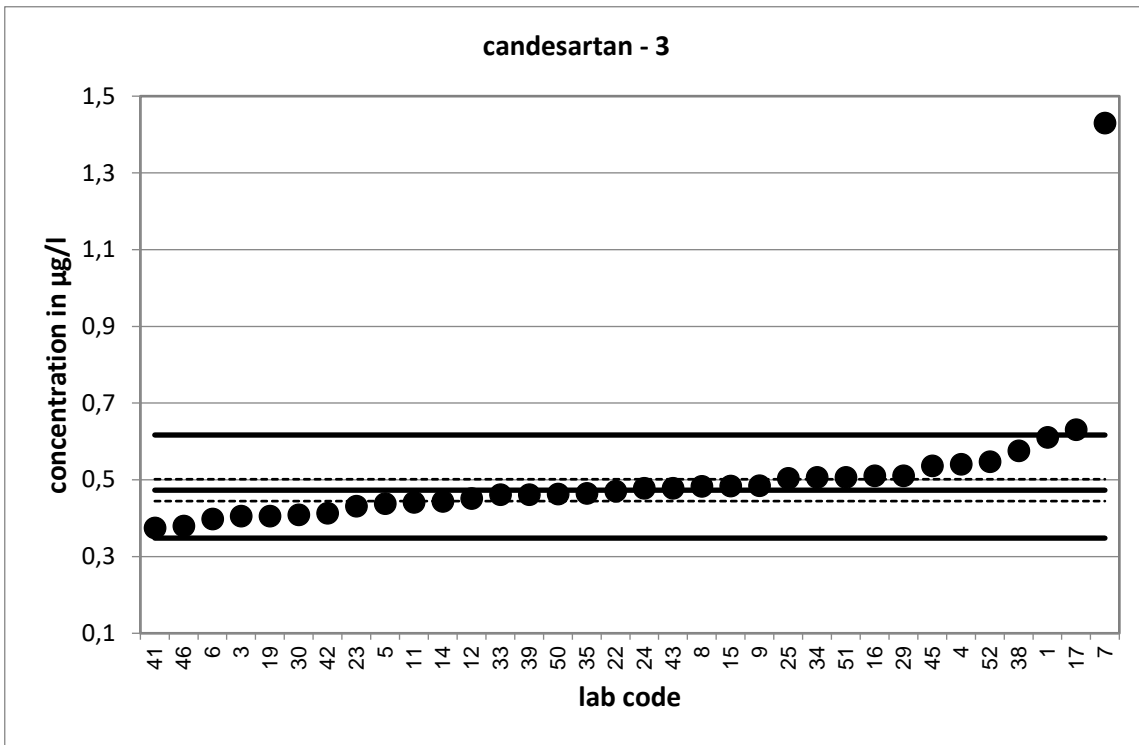




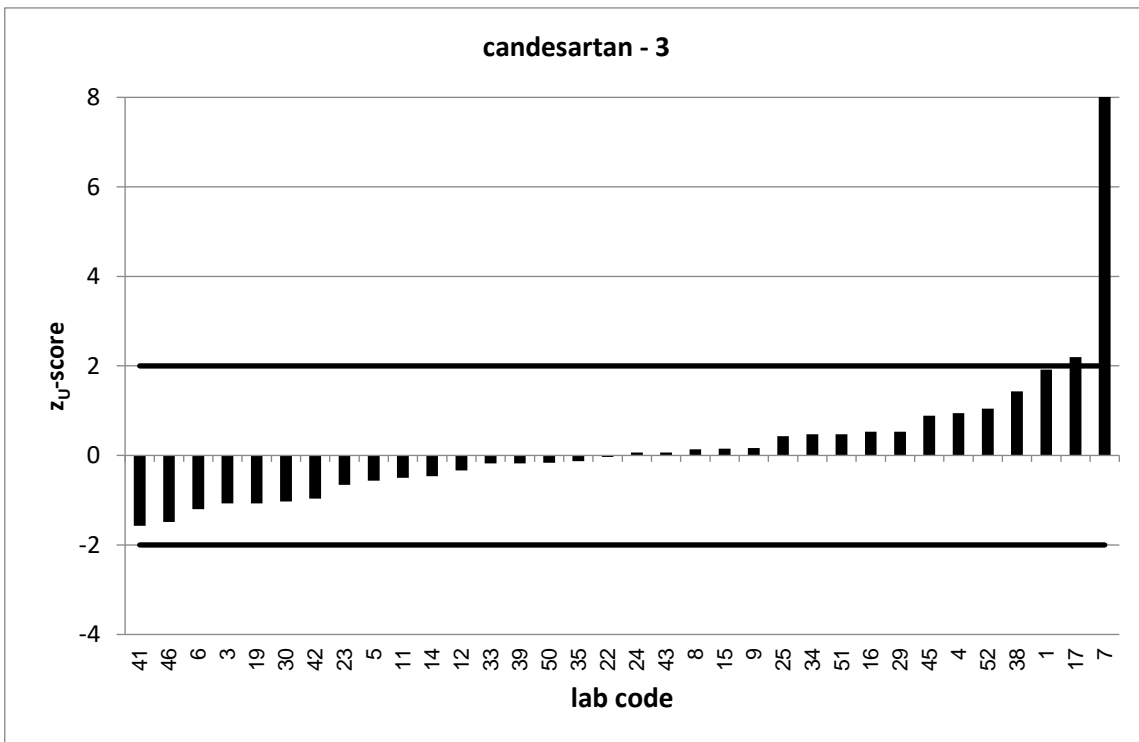
PT 4/23 - TW S2		candesartan - 3			
assigned value [ $\mu\text{g/l}$ ]*		0,473 $\pm$ 0,0285			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,6168			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,3481			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,611	0,244	1,1	1,9	s
3	0,406	0,102	-1,3	-1,1	s
4	0,541	0,189	0,7	0,9	s
5	0,438	0,114	-0,6	-0,6	s
6	0,398			-1,2	s
7	1,43	0,29	6,6	13,3	u
8	0,483			0,1	s
9	0,485	0,102	0,2	0,2	s
11	0,442			-0,5	s
12	0,4519	0,039	-0,9	-0,3	s
14	0,444			-0,5	s
15	0,484			0,2	s
16	0,511	0,289	0,3	0,5	s
17	0,631			2,2	q
19	0,406			-1,1	s
22	0,471	0,071	-0,1	0,0	s
23	0,432	0,095	-0,8	-0,7	s
24	0,478			0,1	s
25	0,504	0,021	1,7	0,4	s
29	0,511	0,002	2,7	0,5	s
30	0,409	0,119	-1,0	-1,0	s
33	0,462			-0,2	s
34	0,507	0,13	0,5	0,5	s
35	0,465	0,018	-0,5	-0,1	s
38	0,576	0,025	5,4	1,4	s
39	0,462	0,164	-0,1	-0,2	s
41	0,375	0,1	-1,9	-1,6	s
42	0,413	0,275	-0,4	-1,0	s
43	0,478	0,096	0,1	0,1	s
45	0,537	0,161	0,8	0,9	s
46	0,38			-1,5	s
50	0,463	0,065	-0,3	-0,2	s
51	0,507			0,5	s
52	0,548	0,013	4,8	1,0	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

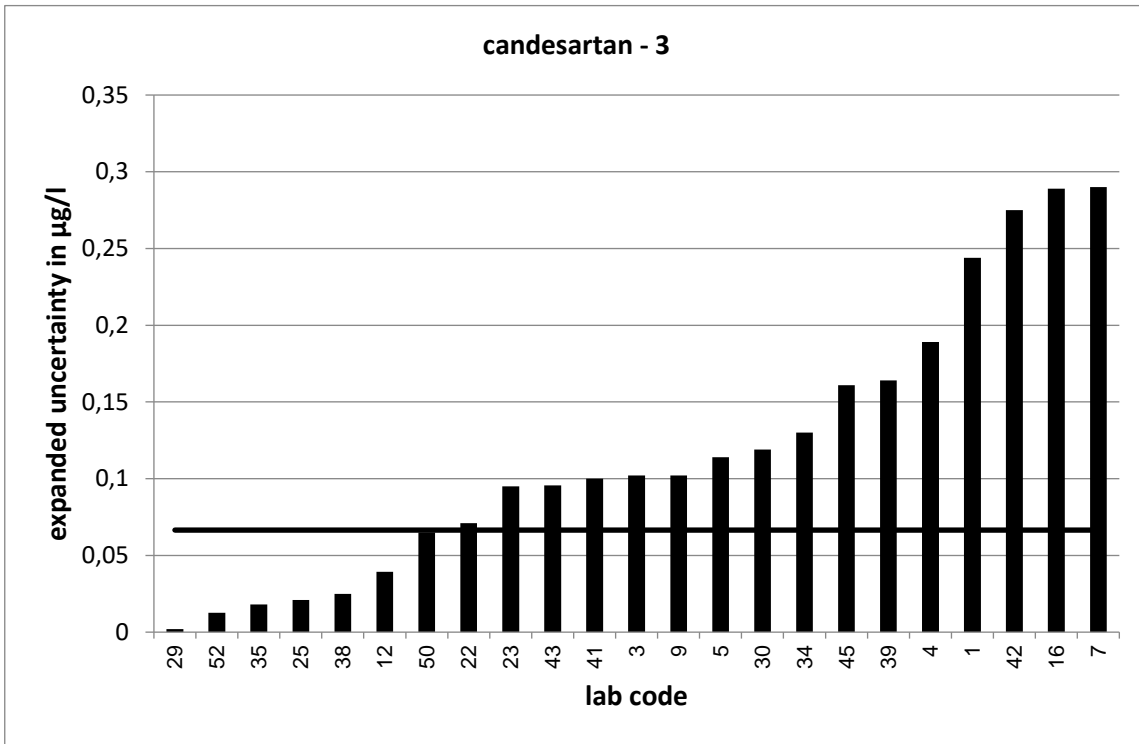
\*\* s = satisfactory, q = questionable, u = unsatisfactory



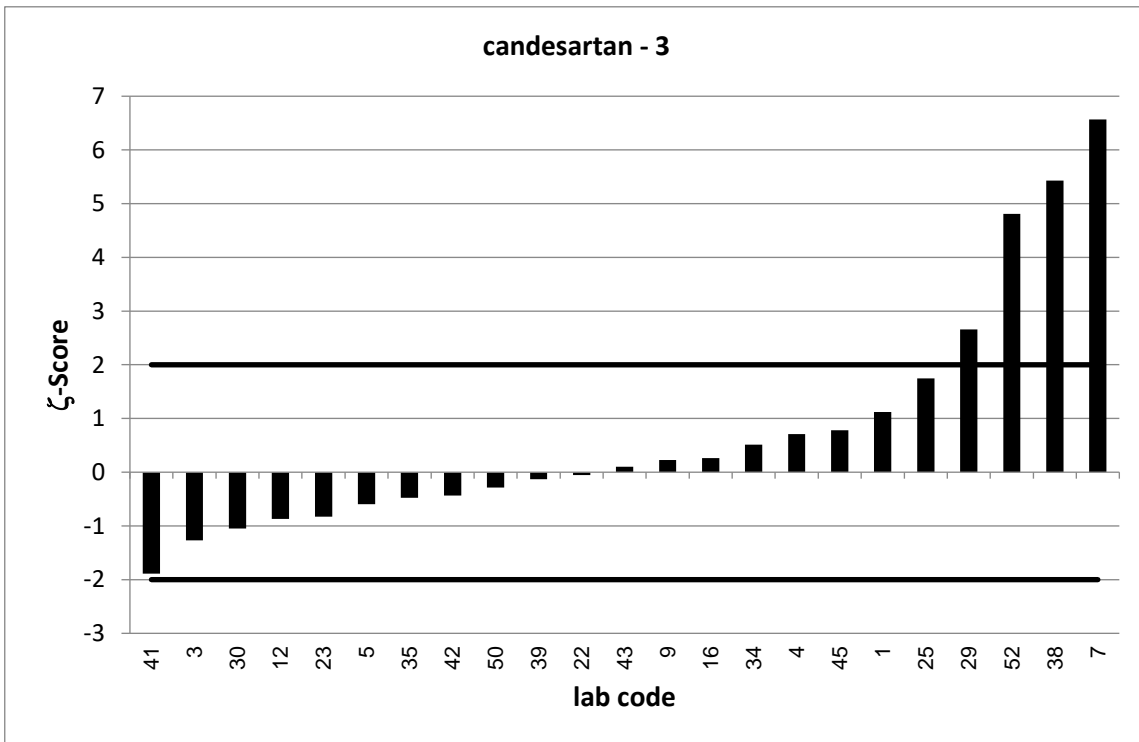
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



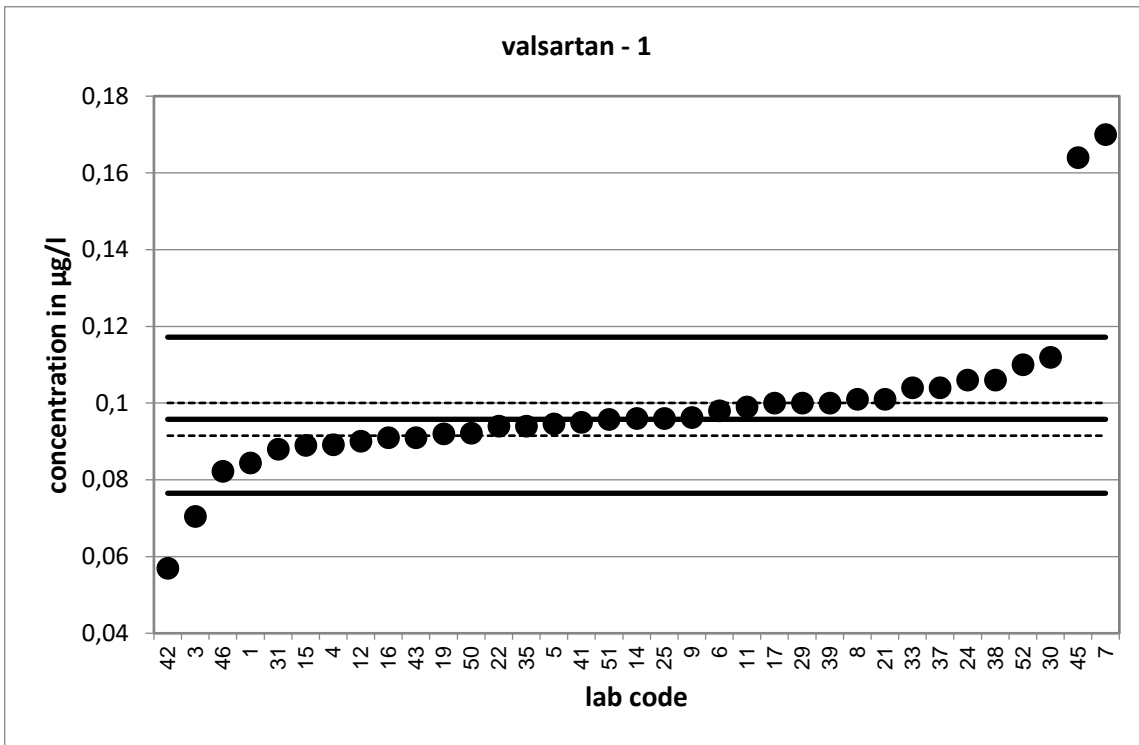
Strongly deviating values are not correctly shown in the diagram.



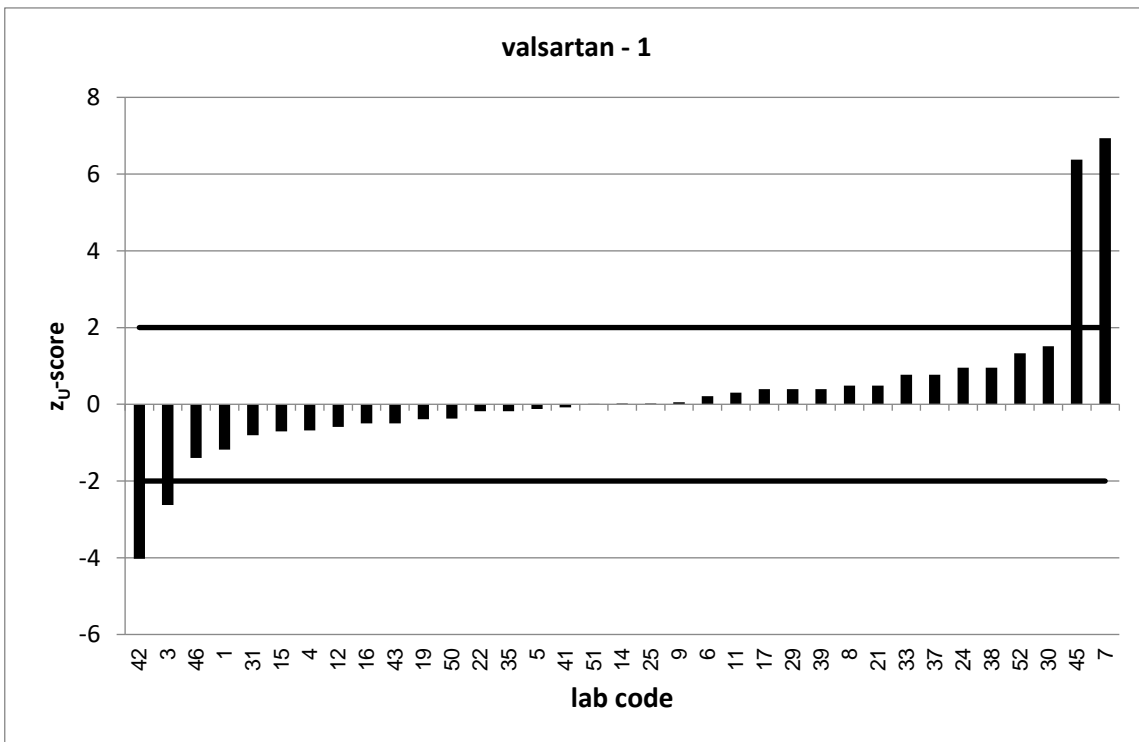
PT 4/23 - TW S2		valsartan - 1			
assigned value [ $\mu\text{g/l}$ ]*		0,09577 $\pm$ 0,00427			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,1172			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,0765			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,0844	0,034	-0,7	-1,2	s
3	0,0705	0,018	-2,8	-2,6	q
4	0,0892	0,031	-0,4	-0,7	s
5	0,0946	0,019	-0,1	-0,1	s
6	0,098			0,2	s
7	0,17	0,03	4,9	6,9	u
8	0,101			0,5	s
9	0,0963	0,012	0,1	0,0	s
11	0,099			0,3	s
12	0,0901	0,02	-0,6	-0,6	s
14	0,096			0,0	s
15	0,089			-0,7	s
16	0,091	0,051	-0,2	-0,5	s
17	0,1			0,4	s
19	0,092			-0,4	s
21	0,101	0,03	0,3	0,5	s
22	0,094	0,014	-0,2	-0,2	s
24	0,106			1,0	s
25	0,096	0,011	0,0	0,0	s
29	0,1	0,005	1,3	0,4	s
30	0,112	0,033	1,0	1,5	s
31	0,088			-0,8	s
33	0,104			0,8	s
35	0,094	0,014	-0,2	-0,2	s
37	0,104	0,031	0,5	0,8	s
38	0,106	0,005	3,1	1,0	s
39	0,1	0,031	0,3	0,4	s
41	0,095	0,02	-0,1	-0,1	s
42	0,057	0,028	-2,7	-4,0	u
43	0,091	0,018	-0,5	-0,5	s
45	0,164	0,049	2,8	6,4	u
46	0,0823			-1,4	s
50	0,0922	0,031	-0,2	-0,4	s
51	0,0958			0,0	s
52	0,11	0,015	1,8	1,3	s

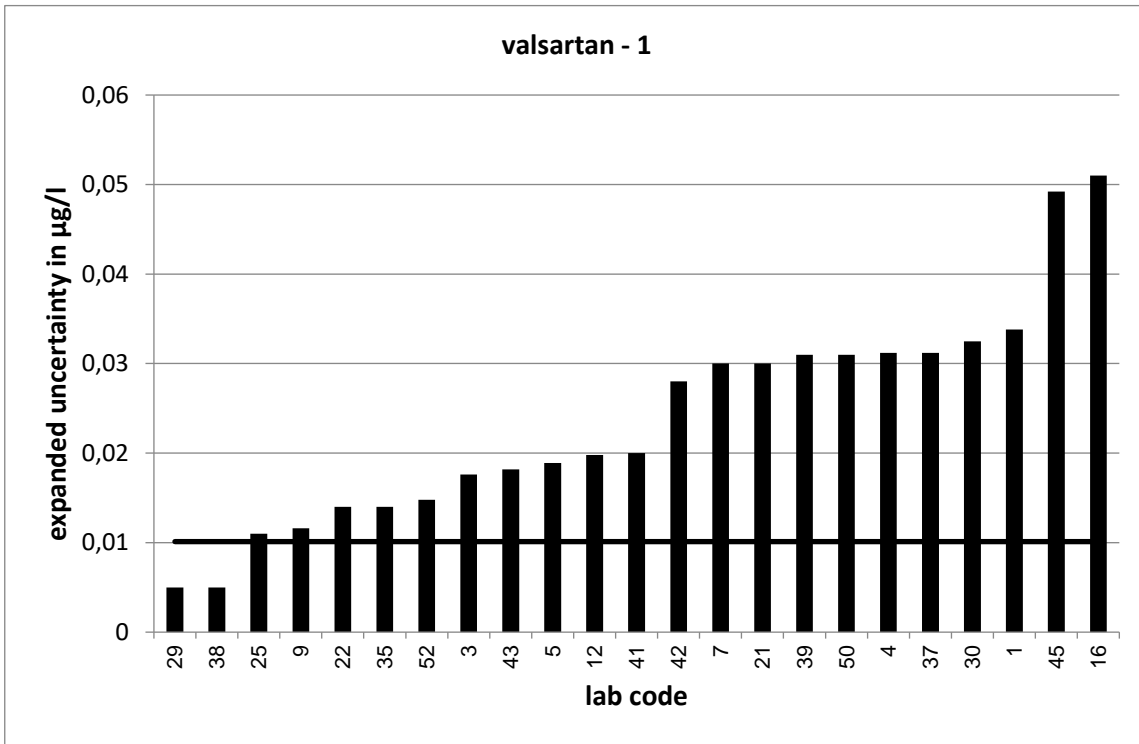
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

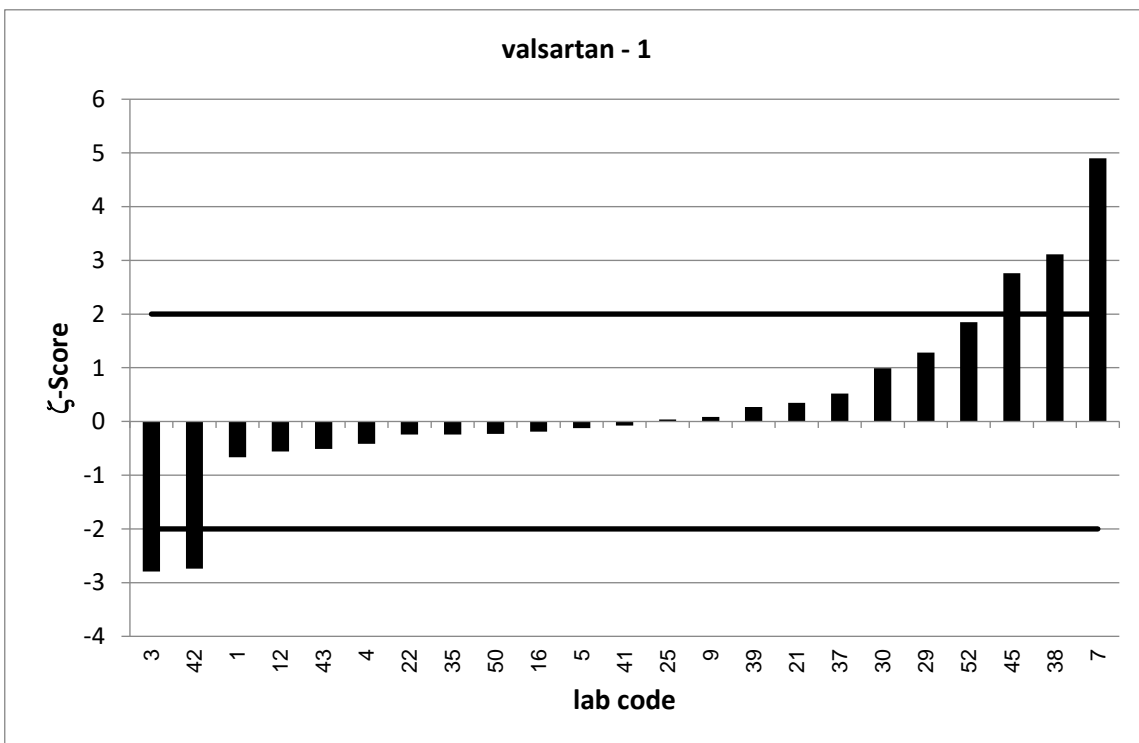


Strongly deviating values are not shown in the diagram.





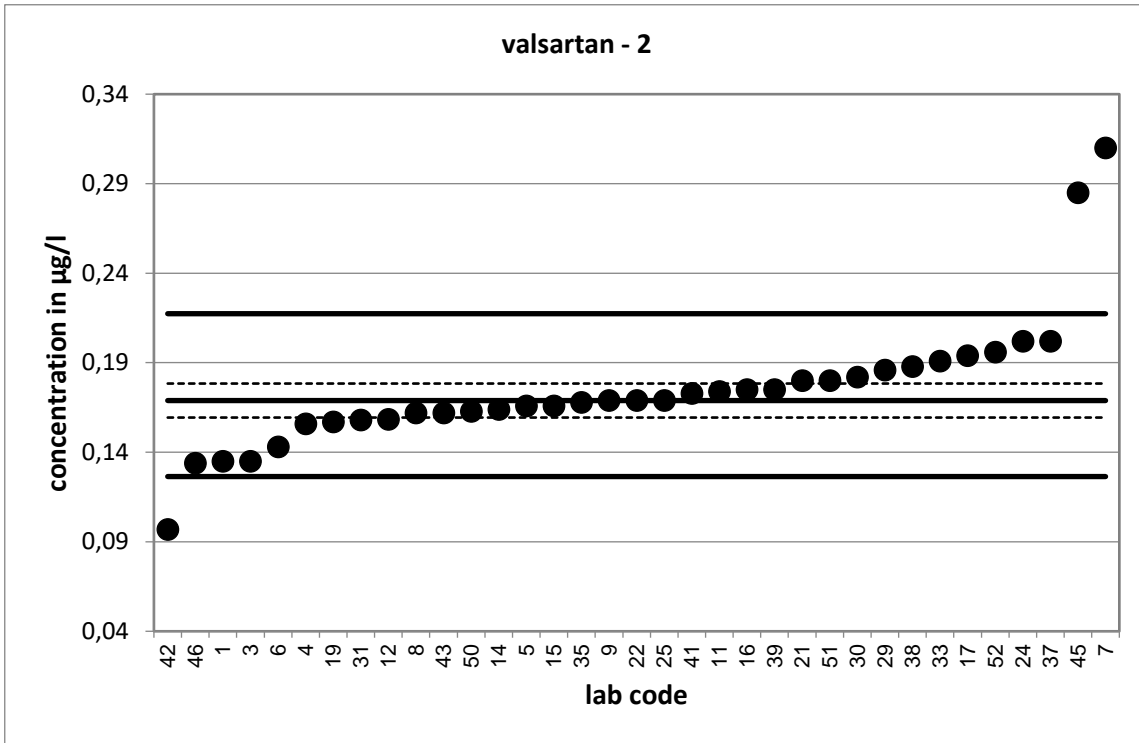
Strongly deviating values are not correctly shown in the diagram.



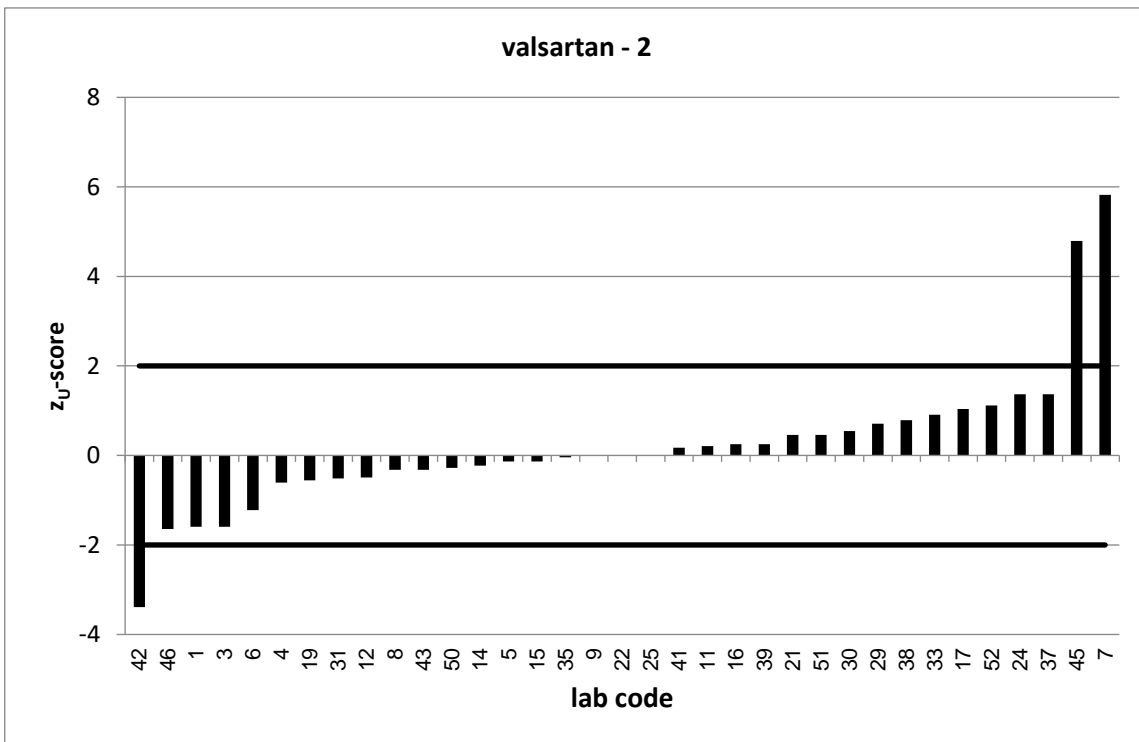
PT 4/23 - TW S2		valsartan - 2			
assigned value [ $\mu\text{g/l}$ ]*		0,1689 $\pm$ 0,0095			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,2174			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,1264			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	$z_U$ -score	assessm.**
1	0,135	0,054	-1,2	-1,6	s
3	0,135	0,034	-1,9	-1,6	s
4	0,156	0,054	-0,5	-0,6	s
5	0,166	0,033	-0,2	-0,1	s
6	0,143			-1,2	s
7	0,31	0,06	4,6	5,8	u
8	0,162			-0,3	s
9	0,169	0,02	0,0	0,0	s
11	0,174			0,2	s
12	0,1584	0,035	-0,6	-0,5	s
14	0,164			-0,2	s
15	0,166			-0,1	s
16	0,175	0,978	0,0	0,3	s
17	0,194			1,0	s
19	0,157			-0,6	s
21	0,18	0,054	0,4	0,5	s
22	0,169	0,025	0,0	0,0	s
24	0,202			1,4	s
25	0,169	0,021	0,0	0,0	s
29	0,186	0,005	3,2	0,7	s
30	0,182	0,053	0,5	0,5	s
31	0,158			-0,5	s
33	0,191			0,9	s
35	0,168	0,015	-0,1	0,0	s
37	0,202	0,061	1,1	1,4	s
38	0,188	0,009	2,9	0,8	s
39	0,175	0,054	0,2	0,3	s
41	0,173	0,06	0,1	0,2	s
42	0,097	0,047	-3,0	-3,4	u
43	0,162	0,032	-0,4	-0,3	s
45	0,285	0,085	2,7	4,8	u
46	0,134			-1,6	s
50	0,163	0,055	-0,2	-0,3	s
51	0,18			0,5	s
52	0,196	0,02	2,4	1,1	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

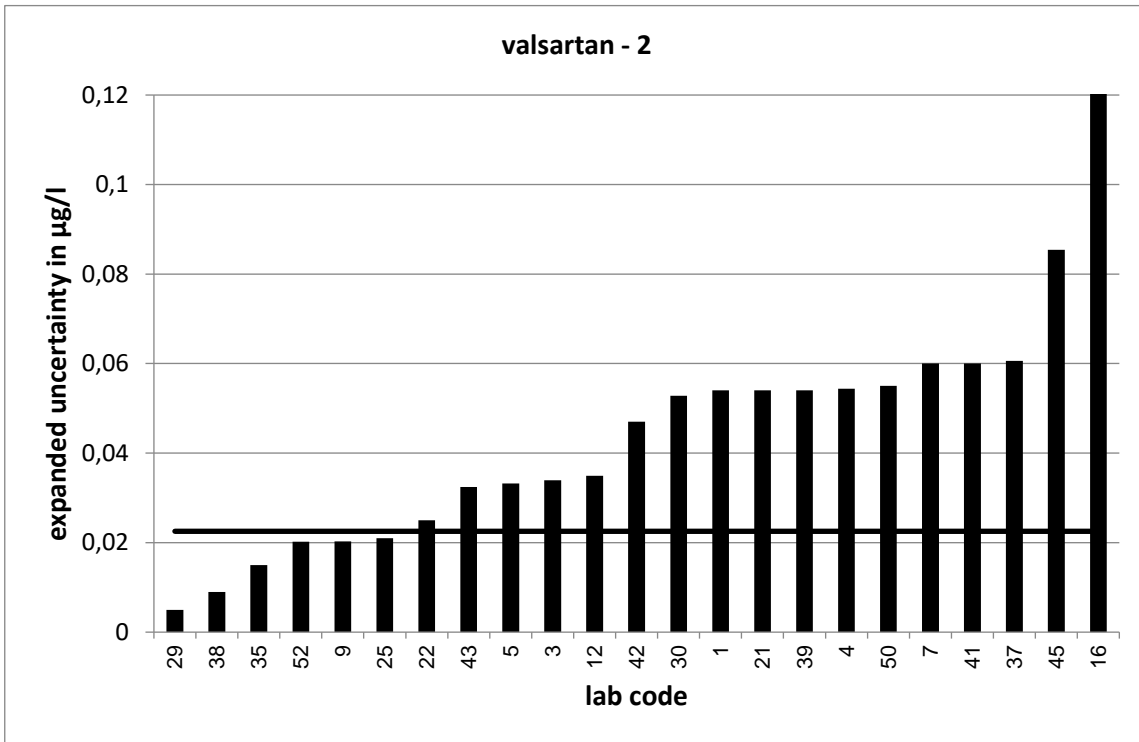
\*\* s = satisfactory, q = questionable, u = unsatisfactory



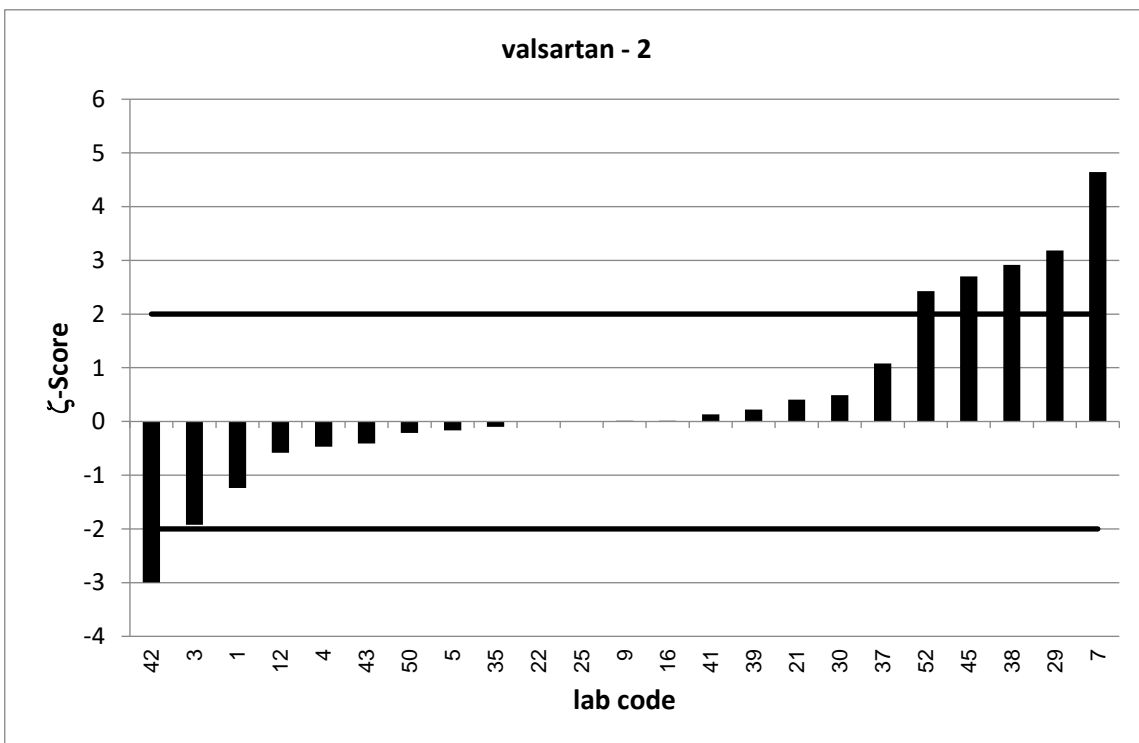
Strongly deviating values are not shown in the diagram.







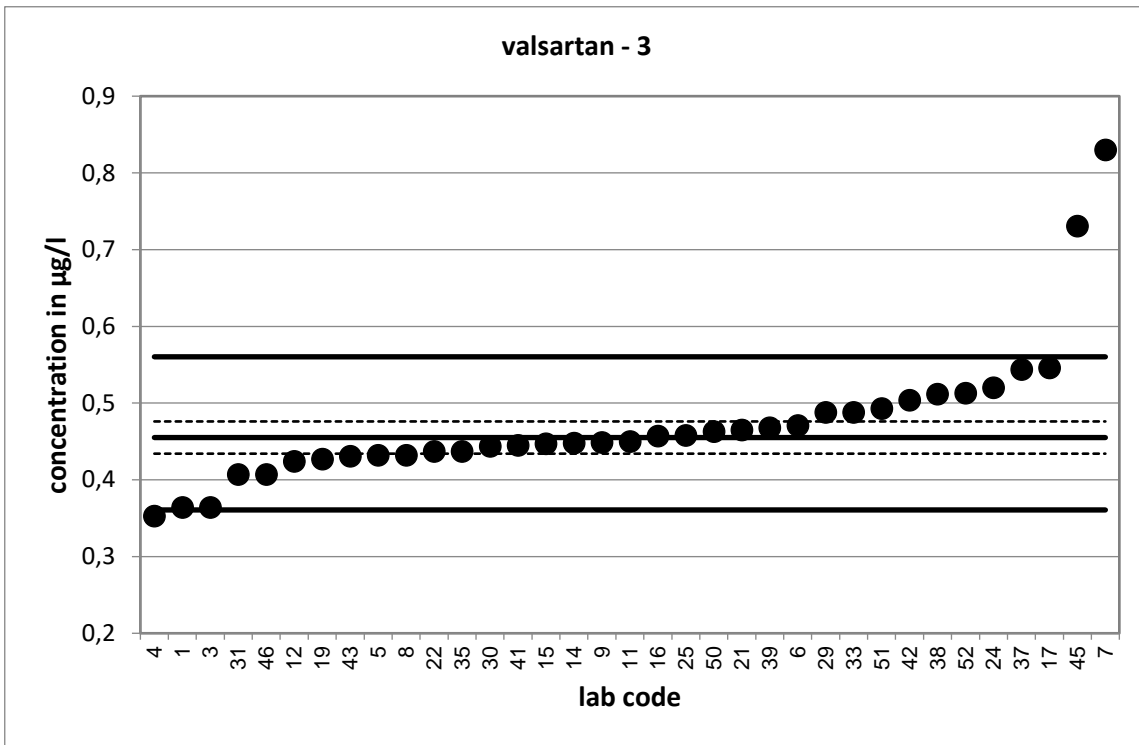
Strongly deviating values are not correctly shown in the diagram.



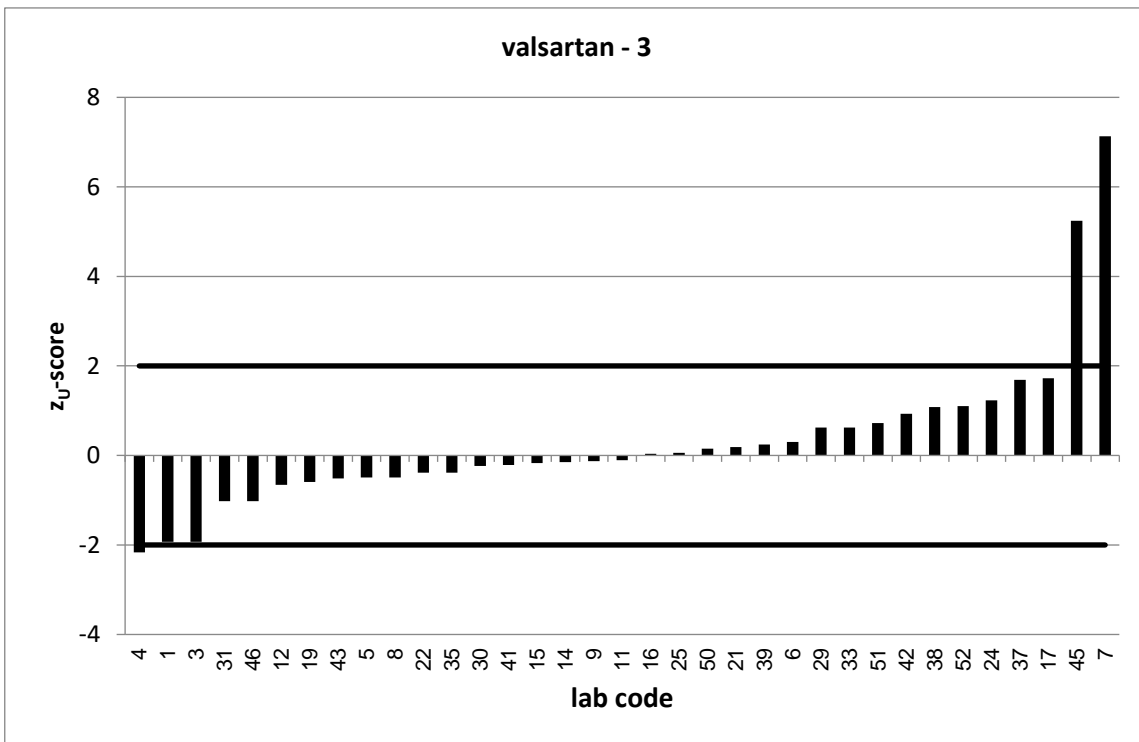
PT 4/23 - TW S2		valsartan - 3			
assigned value [ $\mu\text{g/l}$ ]*		0,4551 $\pm$ 0,021			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,5603			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,3607			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	$z_U$ -score	assessm.**
1	0,364	0,146	-1,2	-1,9	s
3	0,364	0,091	-2,0	-1,9	s
4	0,353	0,124	-1,6	-2,2	q
5	0,432	0,086	-0,5	-0,5	s
6	0,471			0,3	s
7	0,83	0,17	4,4	7,1	u
8	0,432			-0,5	s
9	0,449	0,054	-0,2	-0,1	s
11	0,45			-0,1	s
12	0,4242	0,093	-0,6	-0,7	s
14	0,448			-0,2	s
15	0,447			-0,2	s
16	0,457	0,256	0,0	0,0	s
17	0,546			1,7	s
19	0,427			-0,6	s
21	0,465	0,14	0,1	0,2	s
22	0,437	0,066	-0,5	-0,4	s
24	0,52			1,2	s
25	0,458	0,022	0,2	0,1	s
29	0,488	0,005	3,1	0,6	s
30	0,444	0,129	-0,2	-0,2	s
31	0,407			-1,0	s
33	0,488			0,6	s
35	0,437	0,044	-0,7	-0,4	s
37	0,544	0,163	1,1	1,7	s
38	0,512	0,024	3,6	1,1	s
39	0,468	0,145	0,2	0,2	s
41	0,445	0,1	-0,2	-0,2	s
42	0,504	0,246	0,4	0,9	s
43	0,431	0,086	-0,5	-0,5	s
45	0,731	0,219	2,5	5,2	u
46	0,407			-1,0	s
50	0,463	0,157	0,1	0,2	s
51	0,493			0,7	s
52	0,513	0,016	4,4	1,1	s

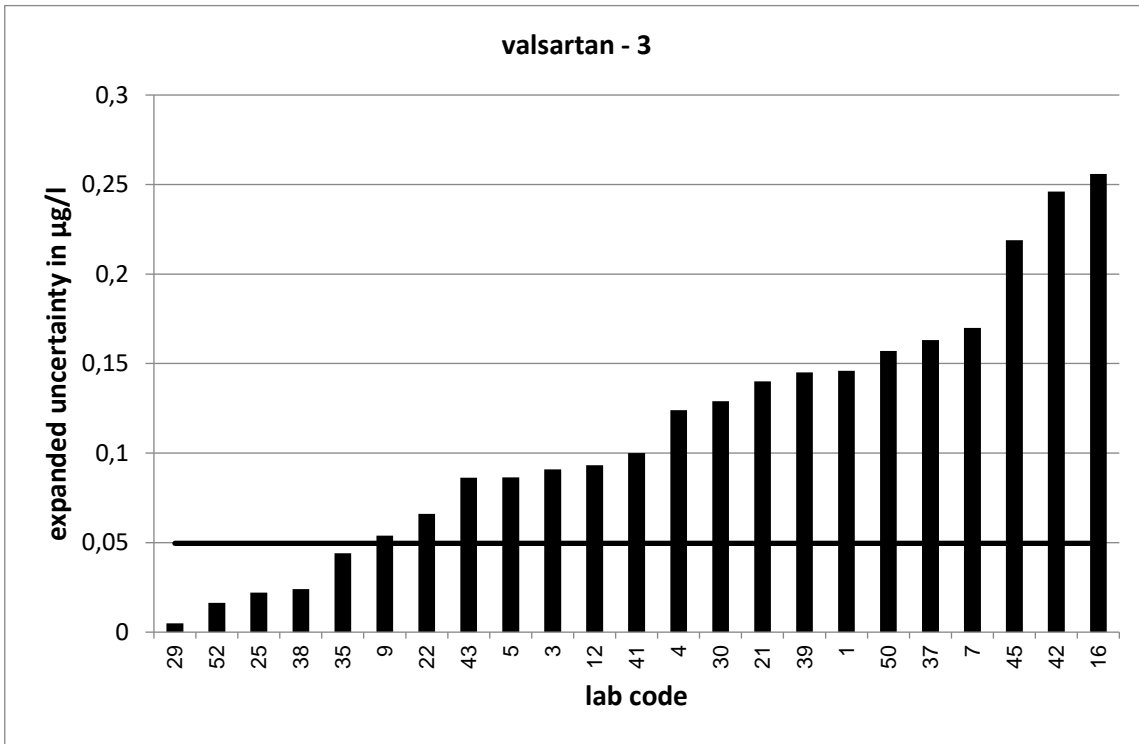
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

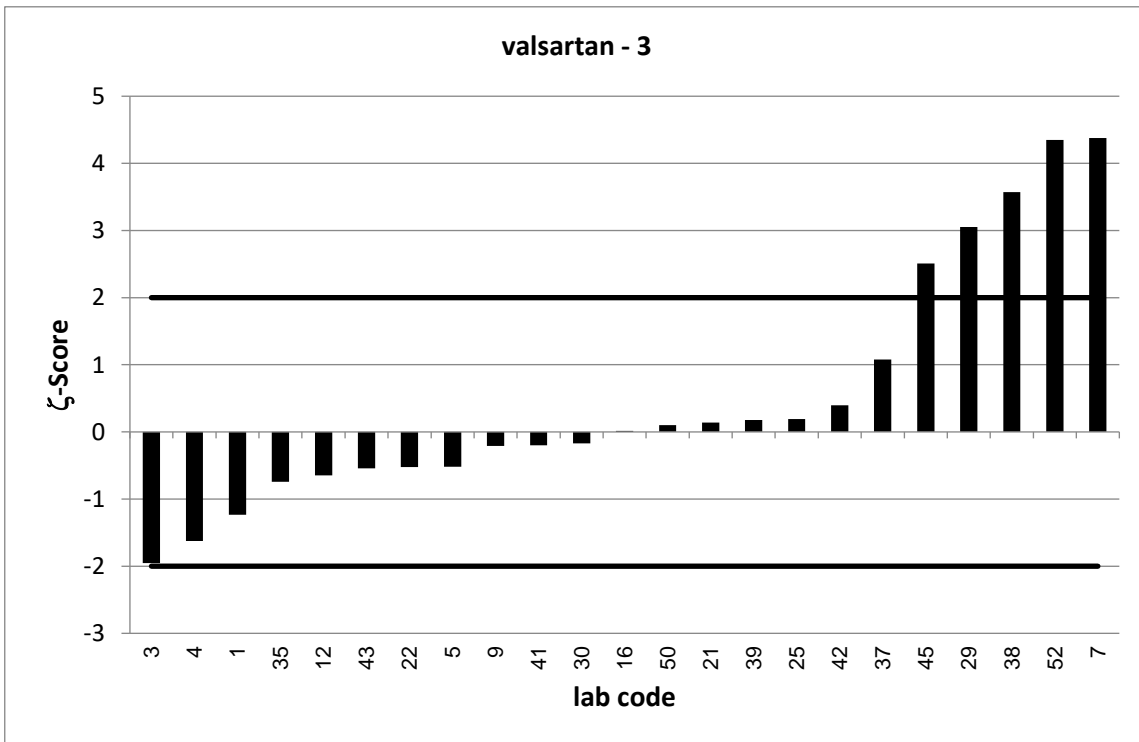


Strongly deviating values are not shown in the diagram.





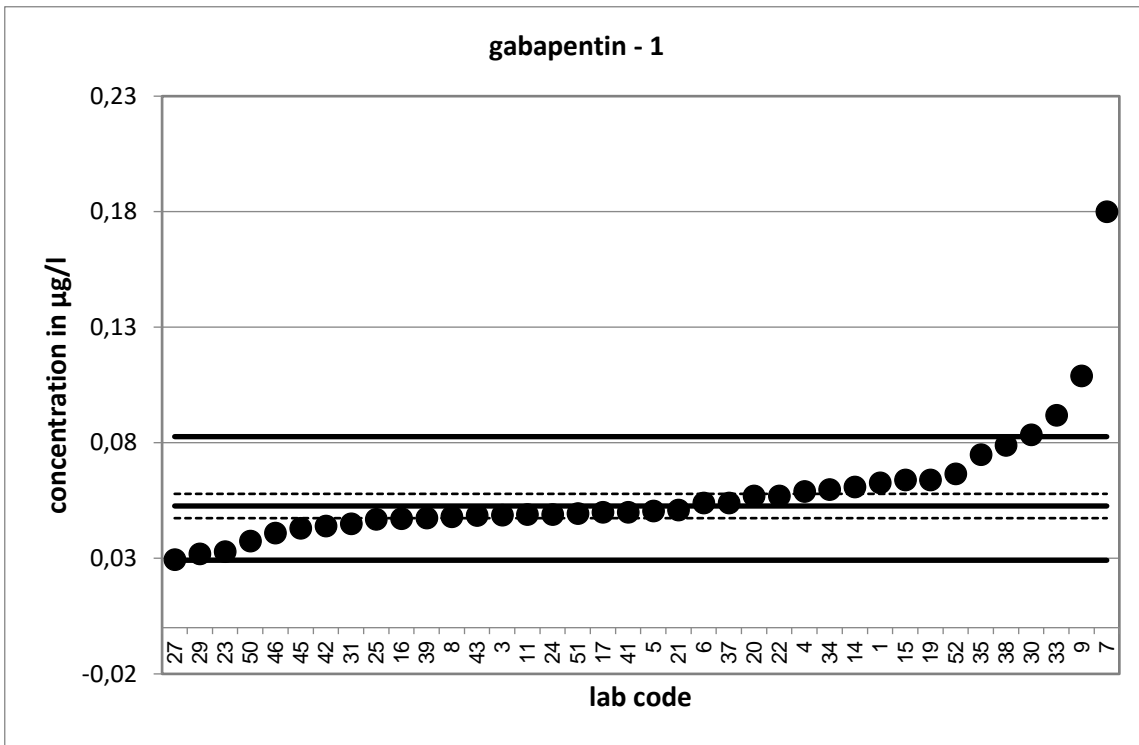
Strongly deviating values are not correctly shown in the diagram.



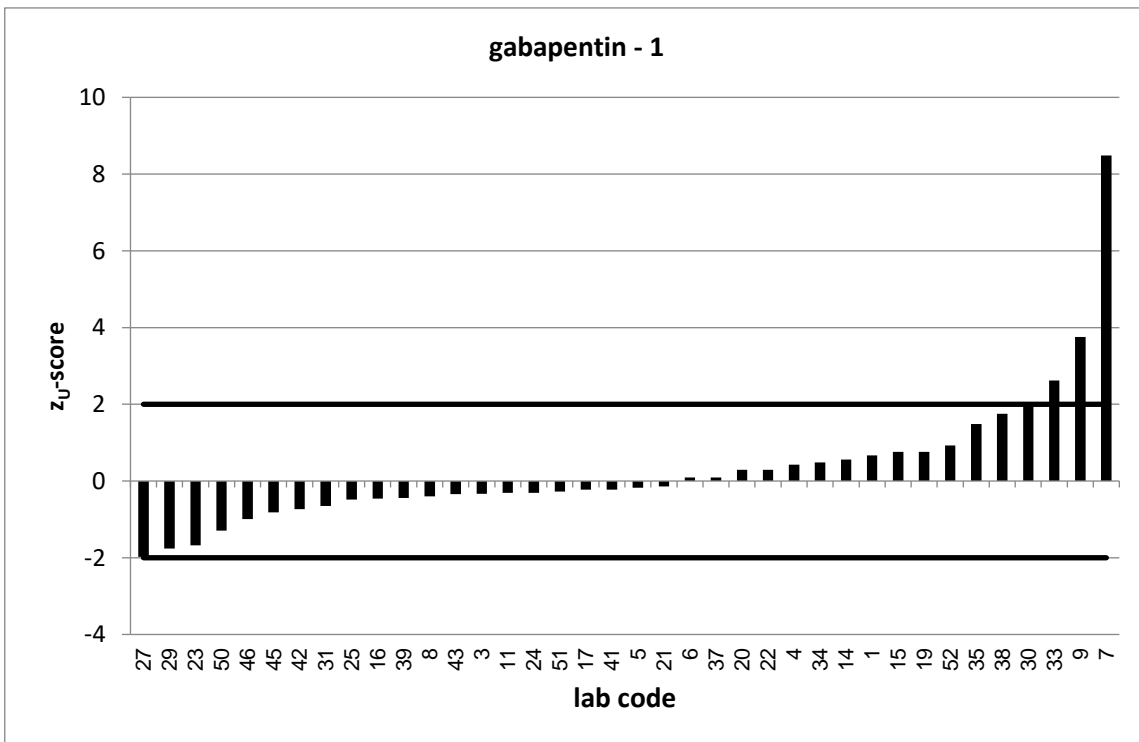
PT 4/23 - TW S2		gabapentin - 1			
assigned value [ $\mu\text{g/l}$ ]*		0,05265 $\pm$ 0,00526			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,08267			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,02918			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,0627	0,019	1,0	0,7	s
3	0,0487	0,012	-0,6	-0,3	s
4	0,059	0,021	0,6	0,4	s
5	0,0506	0,018	-0,2	-0,2	s
6	0,054			0,1	s
7	0,18	0,04	6,3	8,5	u
8	0,048			-0,4	s
9	0,109	0,022	5,0	3,8	u
11	0,049			-0,3	s
14	0,061			0,6	s
15	0,064			0,8	s
16	0,0473	0,028	-0,4	-0,5	s
17	0,05			-0,2	s
19	0,064			0,8	s
20	0,057	0,014	0,6	0,3	s
21	0,051	0,009	-0,3	-0,1	s
22	0,057	0,008	0,9	0,3	s
23	0,033	0,007	-4,5	-1,7	s
24	0,049			-0,3	s
25	0,047	0,003	-1,9	-0,5	s
27	0,0295	0,014	-3,1	-2,0	s
29	0,032	0,007	-4,7	-1,8	s
30	0,0835	0,03	2,0	2,1	q
31	0,045			-0,7	s
33	0,092			2,6	q
34	0,0599	0,015	0,9	0,5	s
35	0,075	0,012	3,4	1,5	s
37	0,054	0,016	0,2	0,1	s
38	0,079	0,002	9,4	1,8	s
39	0,0475	0,012	-0,8	-0,4	s
41	0,05	0,02	-0,3	-0,2	s
42	0,044	0,022	-0,8	-0,7	s
43	0,0486	0,007	-0,9	-0,3	s
45	0,0431	0,013	-1,4	-0,8	s
46	0,041			-1,0	s
50	0,0375	0,005	-4,2	-1,3	s
51	0,0494			-0,3	s
52	0,0666	0,03	0,9	0,9	s

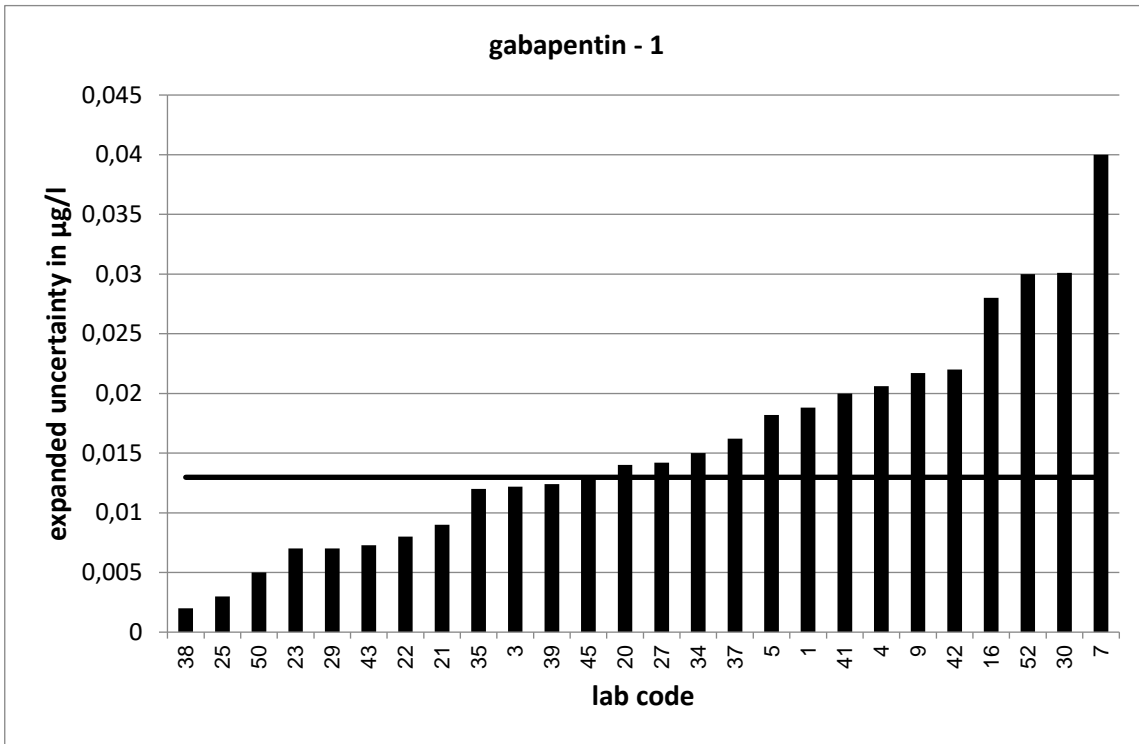
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

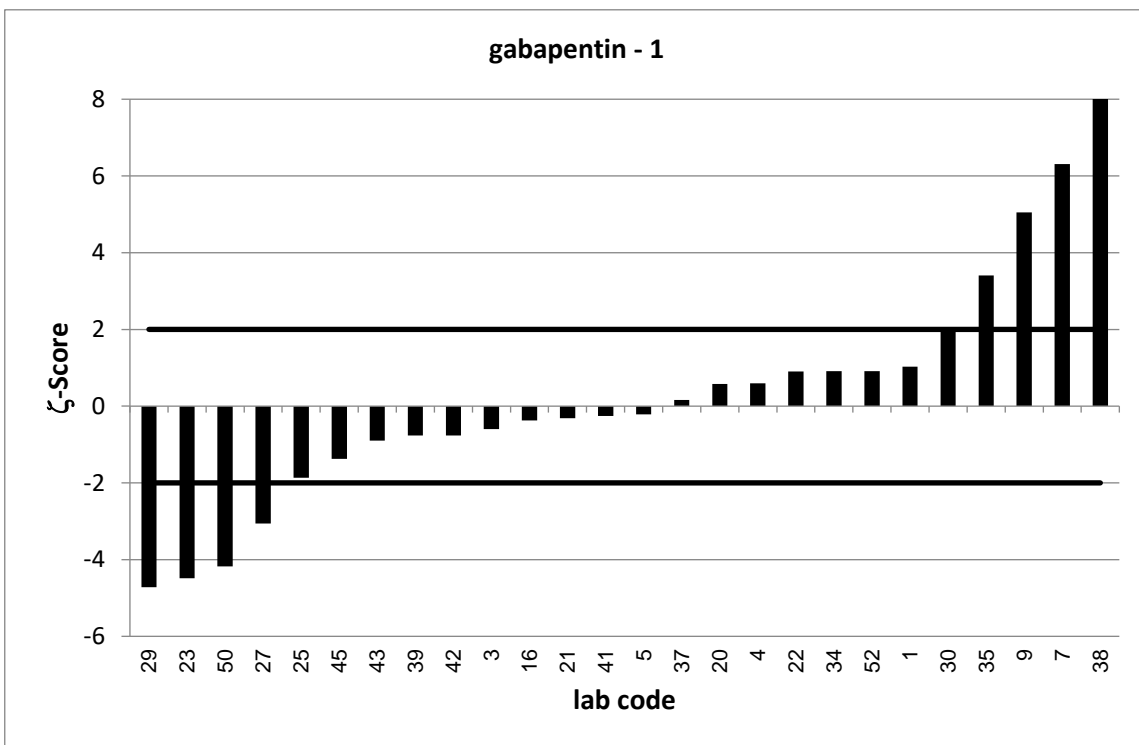


Strongly deviating values are not shown in the diagram.





Strongly deviating values are not correctly shown in the diagram.



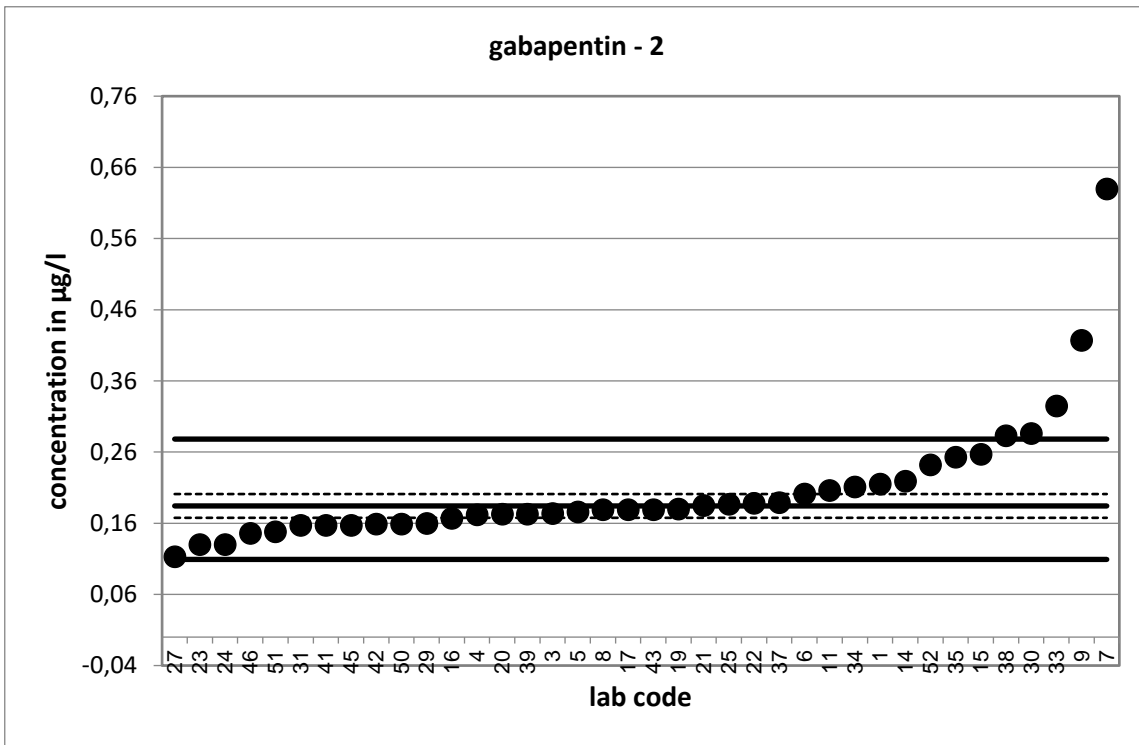
Strongly deviating values are not correctly shown in the diagram.

PT 4/23 - TW S2		gabapentin - 2			
assigned value [ $\mu\text{g/l}$ ]*		0,1843 $\pm$ 0,0167			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,2782			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,1091			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,215	0,065	0,9	0,7	s
3	0,174	0,044	-0,4	-0,3	s
4	0,172	0,06	-0,4	-0,3	s
5	0,176	0,063	-0,3	-0,2	s
6	0,201			0,4	s
7	0,63	0,13	6,8	9,5	u
8	0,179			-0,1	s
9	0,417	0,083	5,5	5,0	u
11	0,206			0,5	s
14	0,219			0,7	s
15	0,257			1,5	s
16	0,167	0,099	-0,3	-0,5	s
17	0,179			-0,1	s
19	0,18			-0,1	s
20	0,173	0,043	-0,5	-0,3	s
21	0,185	0,031	0,0	0,0	s
22	0,188	0,028	0,2	0,1	s
23	0,13	0,029	-3,2	-1,4	s
24	0,13			-1,4	s
25	0,187	0,023	0,2	0,1	s
27	0,113	0,054	-2,5	-1,9	s
29	0,16	0,007	-2,7	-0,6	s
30	0,286	0,103	1,9	2,2	q
31	0,157			-0,7	s
33	0,325			3,0	u
34	0,211	0,053	1,0	0,6	s
35	0,253	0,016	5,9	1,5	s
37	0,189	0,057	0,2	0,1	s
38	0,283	0,006	11,1	2,1	q
39	0,173	0,045	-0,5	-0,3	s
41	0,157	0,04	-1,3	-0,7	s
42	0,159	0,079	-0,6	-0,7	s
43	0,179	0,027	-0,3	-0,1	s
45	0,157	0,047	-1,1	-0,7	s
46	0,146			-1,0	s
50	0,159	0,022	-1,8	-0,7	s
51	0,148			-1,0	s
52	0,242	0,018	4,7	1,2	s

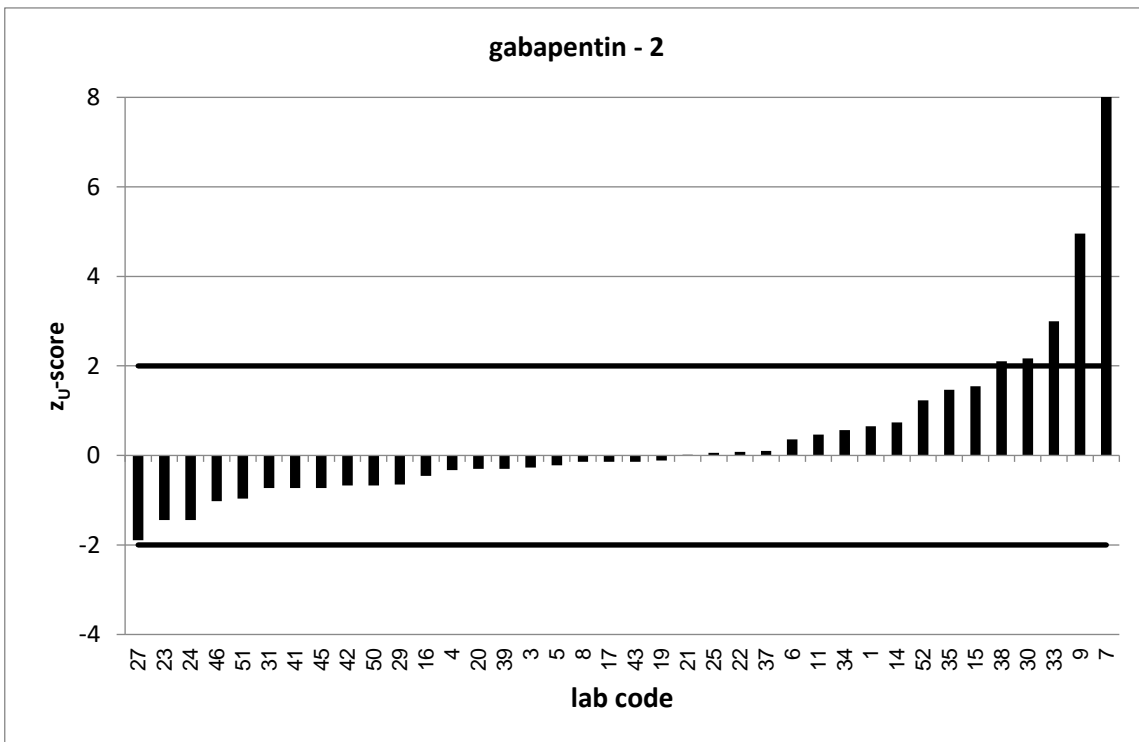
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

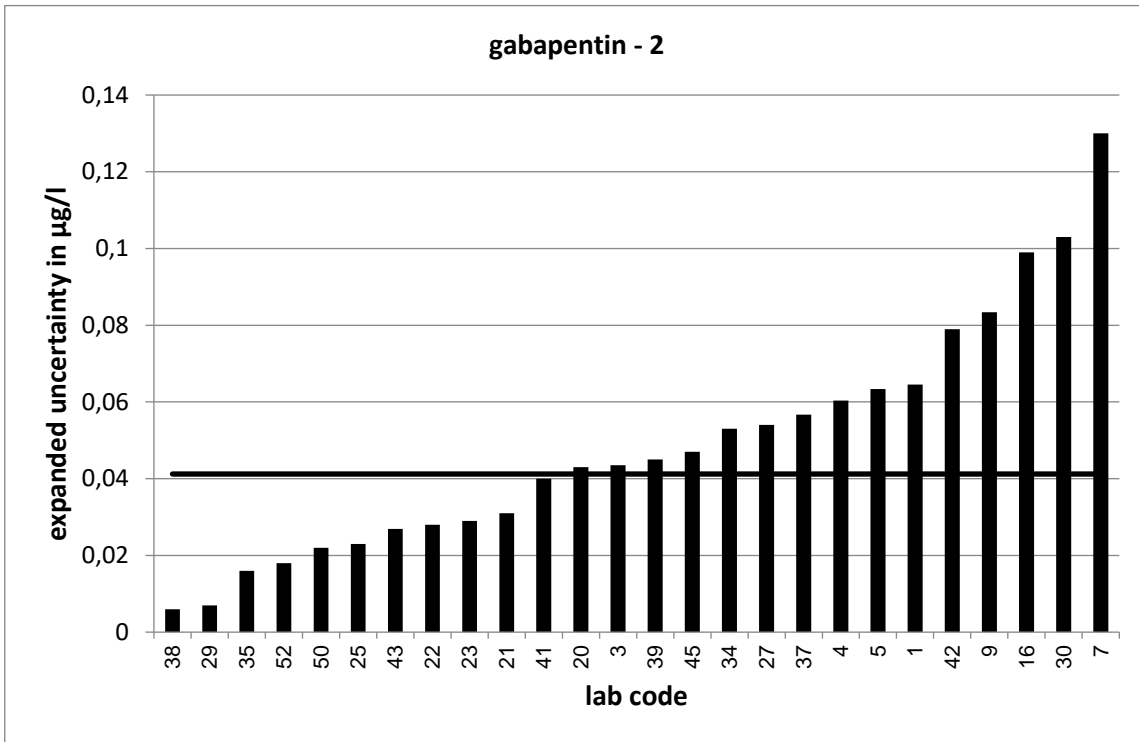




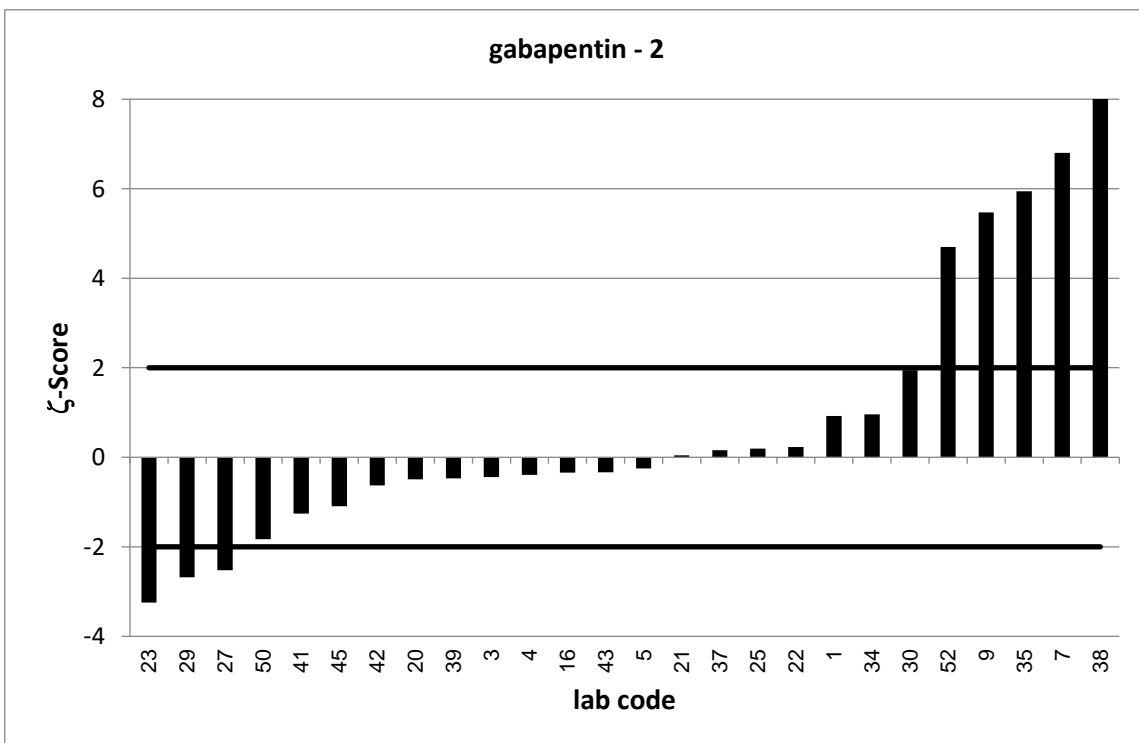
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.

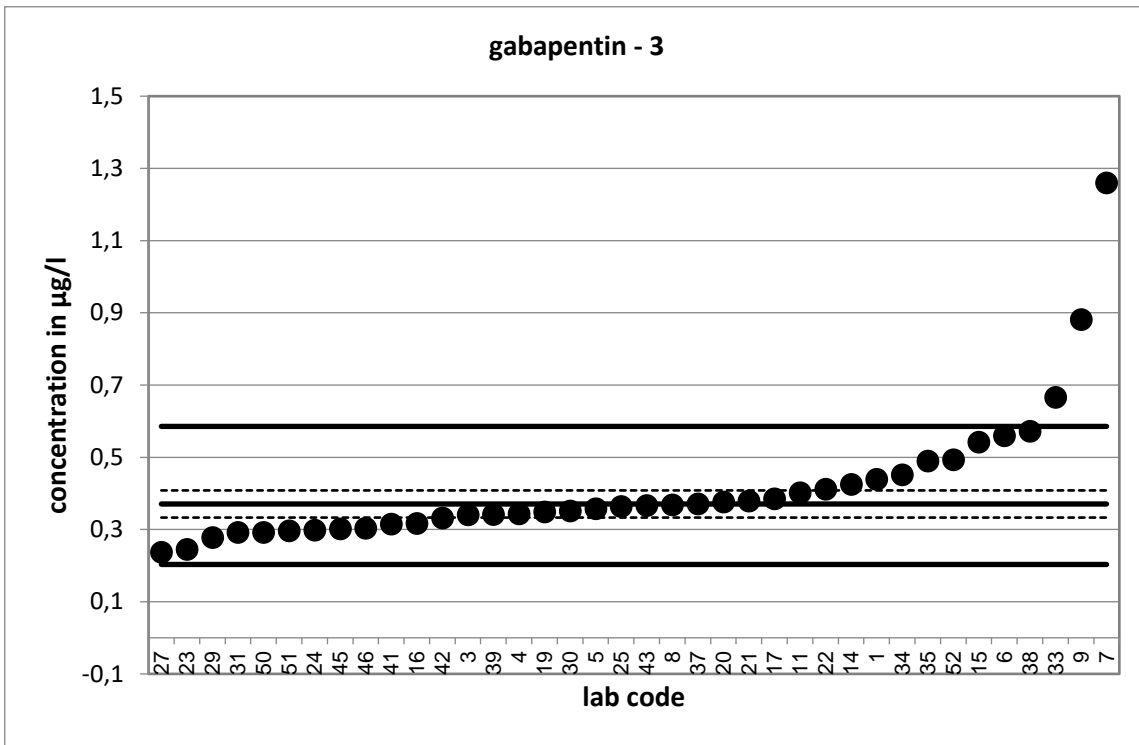


Strongly deviating values are not correctly shown in the diagram.

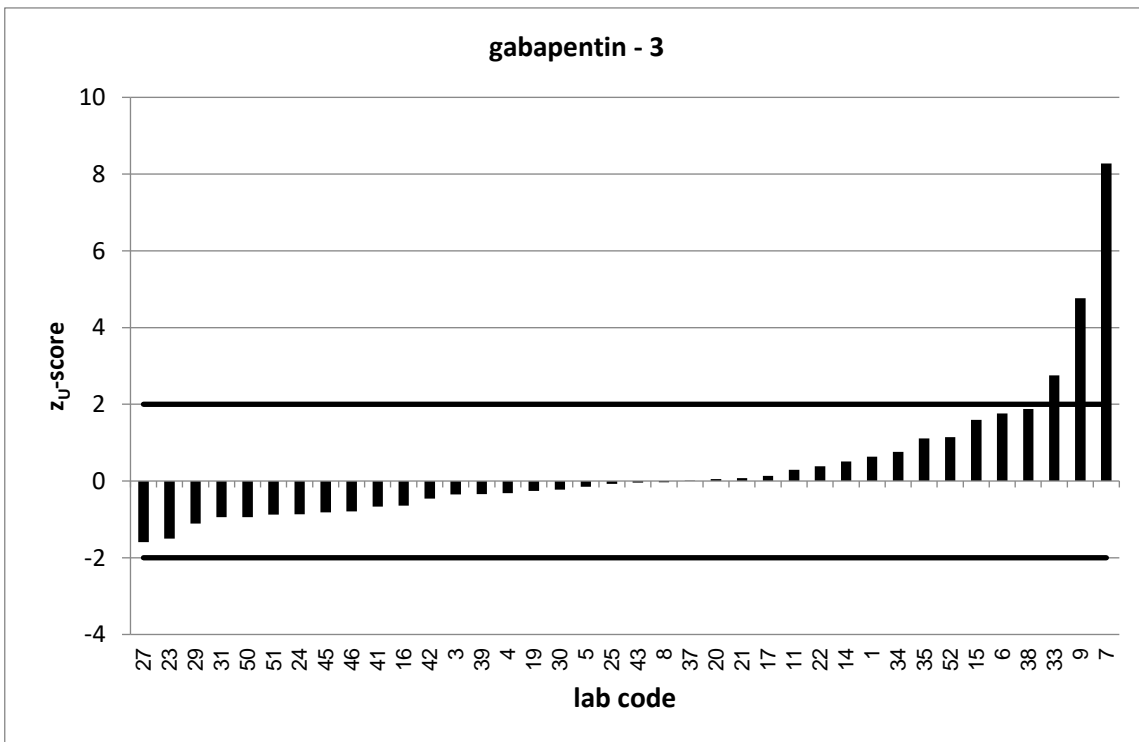
PT 4/23 - TW S2		gabapentin - 3			
assigned value [ $\mu\text{g/l}$ ]*		0,3706 $\pm$ 0,0376			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,5854			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,2031			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,439	0,132	1,0	0,6	s
3	0,341	0,085	-0,6	-0,4	s
4	0,344	0,12	-0,4	-0,3	s
5	0,358	0,129	-0,2	-0,1	s
6	0,56			1,8	s
7	1,26	0,25	7,0	8,3	u
8	0,368			0,0	s
9	0,882	0,176	5,7	4,8	u
11	0,402			0,3	s
14	0,425			0,5	s
15	0,542			1,6	s
16	0,317	0,188	-0,6	-0,6	s
17	0,385			0,1	s
19	0,349			-0,3	s
20	0,376	0,094	0,1	0,1	s
21	0,379	0,064	0,2	0,1	s
22	0,412	0,062	1,1	0,4	s
23	0,245	0,054	-3,8	-1,5	s
24	0,298			-0,9	s
25	0,364	0,035	-0,3	-0,1	s
27	0,237	0,114	-2,2	-1,6	s
29	0,278	0,007	-4,8	-1,1	s
30	0,352	0,127	-0,3	-0,2	s
31	0,292			-0,9	s
33	0,666			2,8	q
34	0,452	0,11	1,4	0,8	s
35	0,49	0,032	4,8	1,1	s
37	0,371	0,111	0,0	0,0	s
38	0,572	0,012	10,2	1,9	s
39	0,342	0,089	-0,6	-0,3	s
41	0,315	0,08	-1,3	-0,7	s
42	0,332	0,166	-0,5	-0,5	s
43	0,367	0,055	-0,1	0,0	s
45	0,302	0,091	-1,4	-0,8	s
46	0,304			-0,8	s
50	0,292	0,041	-2,8	-0,9	s
51	0,297			-0,9	s
52	0,493	0,035	4,8	1,1	s

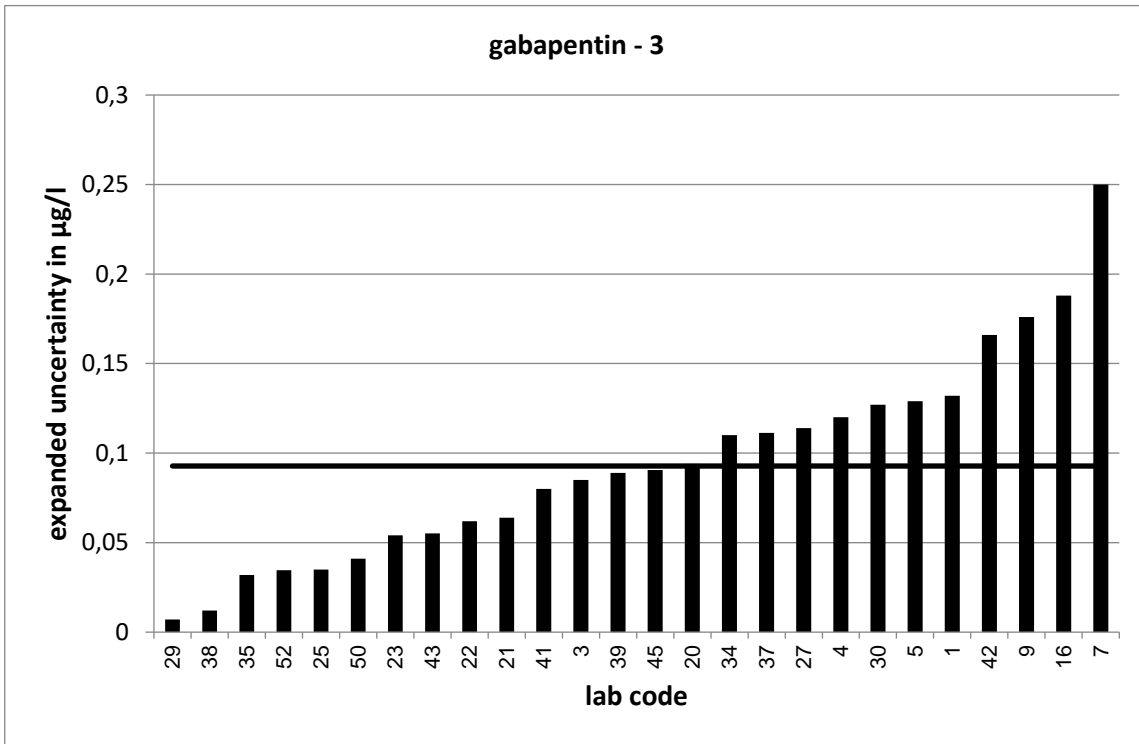
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

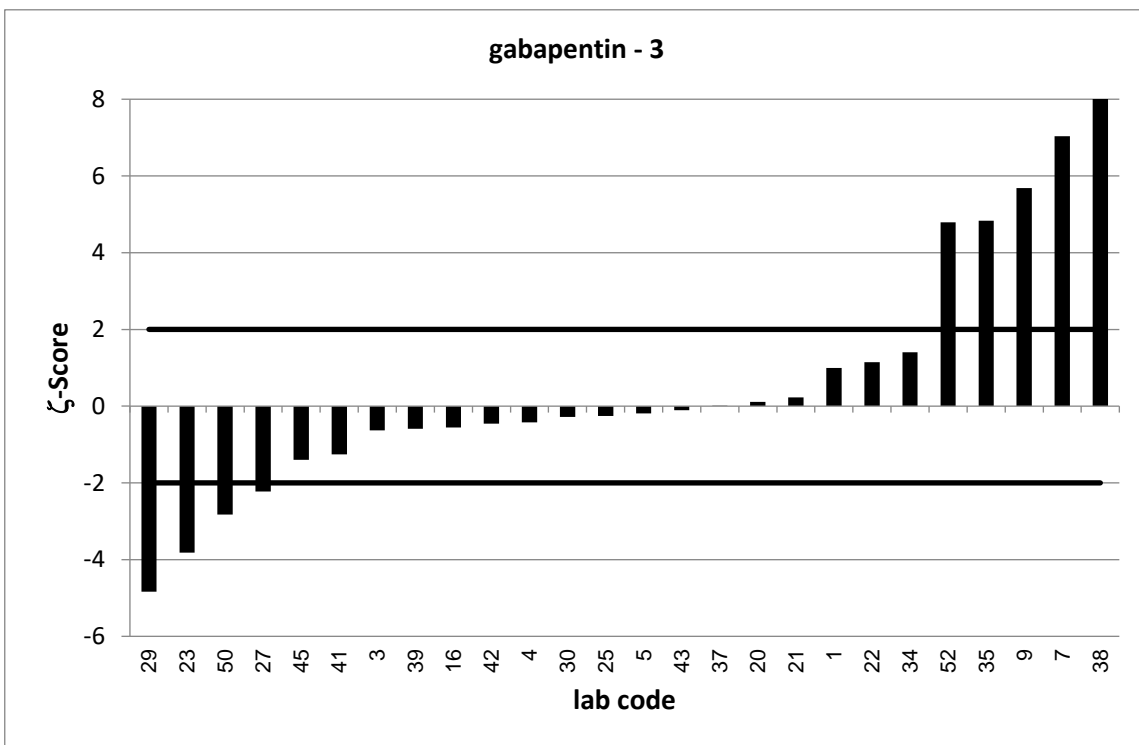


Strongly deviating values are not shown in the diagram.





Strongly deviating values are not correctly shown in the diagram.

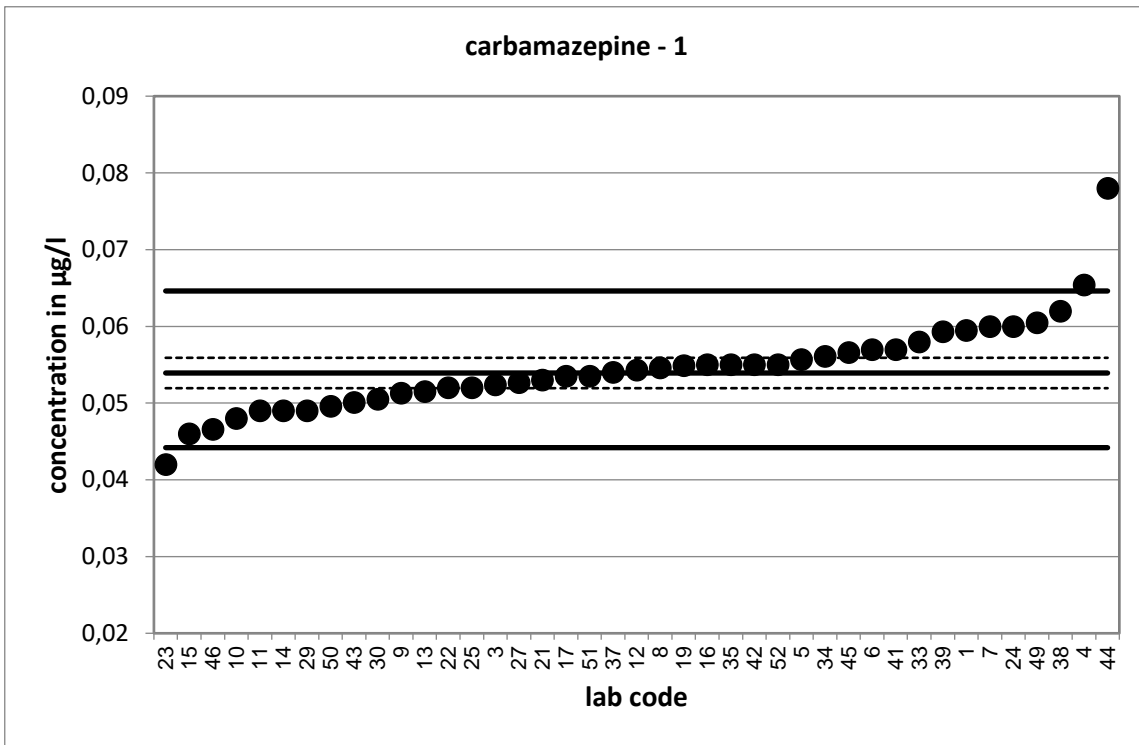


Strongly deviating values are not correctly shown in the diagram.

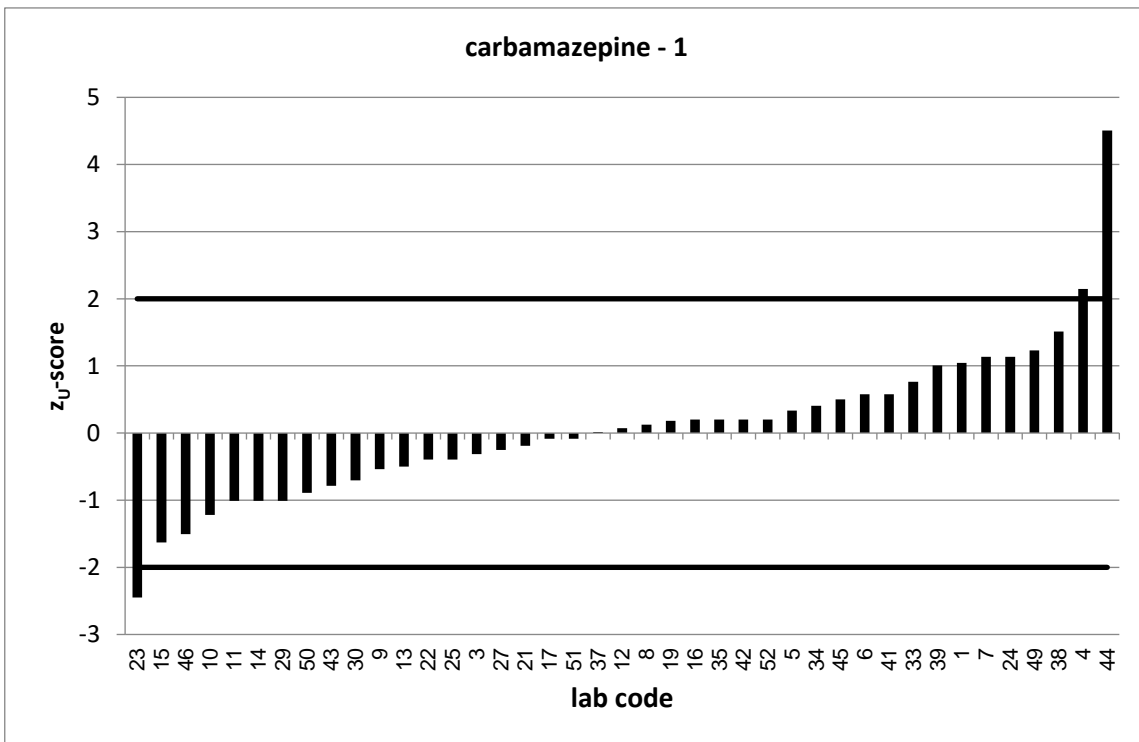
PT 4/23 - TW S2		carbamazepine - 1			
assigned value [ $\mu\text{g/l}$ ]*		0,05392 $\pm$ 0,00198			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,06461			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,04419			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,0595	0,024	0,5	1,0	s
3	0,0524	0,013	-0,2	-0,3	s
4	0,0654	0,016	1,4	2,1	q
5	0,0557	0,013	0,3	0,3	s
6	0,057			0,6	s
7	0,06	0,01	1,2	1,1	s
8	0,0546			0,1	s
9	0,0513	0,007	-0,8	-0,5	s
10	0,048	0,014	-0,8	-1,2	s
11	0,049			-1,0	s
12	0,0543	0,015	0,0	0,1	s
13	0,0515	0,026	-0,2	-0,5	s
14	0,049			-1,0	s
15	0,046			-1,6	s
16	0,055	0,017	0,1	0,2	s
17	0,0535			-0,1	s
19	0,0549			0,2	s
21	0,053	0,007	-0,3	-0,2	s
22	0,052	0,008	-0,5	-0,4	s
23	0,042	0,008	-2,9	-2,5	q
24	0,06			1,1	s
25	0,052	0,001	-1,7	-0,4	s
27	0,0527	0,024	-0,1	-0,3	s
29	0,049	0,005	-1,8	-1,0	s
30	0,0505	0,025	-0,3	-0,7	s
33	0,058			0,8	s
34	0,0561	0,014	0,3	0,4	s
35	0,055	0,004	0,5	0,2	s
37	0,054	0,016	0,0	0,0	s
38	0,062	0,002	5,7	1,5	s
39	0,0593	0,018	0,6	1,0	s
41	0,057	0,02	0,3	0,6	s
42	0,055	0,023	0,1	0,2	s
43	0,0501	0,01	-0,7	-0,8	s
44	0,078	0,02	2,4	4,5	u
45	0,0566	0,017	0,3	0,5	s
46	0,0466			-1,5	s
49	0,0605			1,2	s
50	0,0496	0,008	-1,0	-0,9	s
51	0,0535			-0,1	s
52	0,055	0,003	0,5	0,2	s

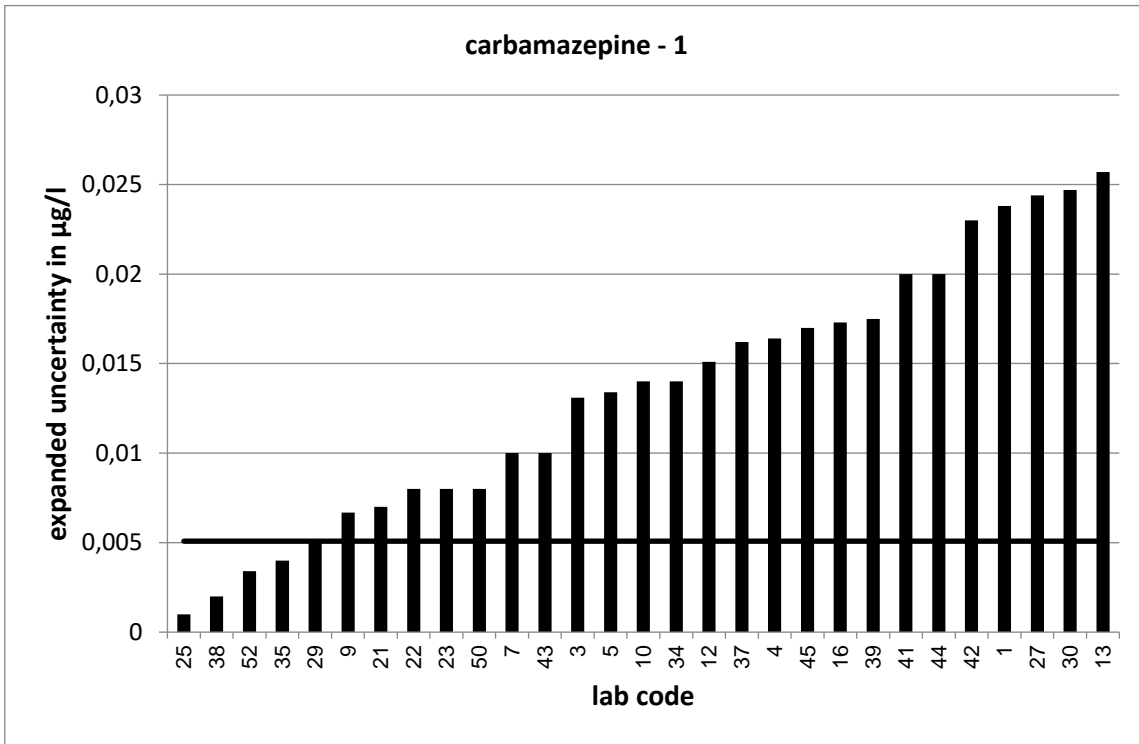
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

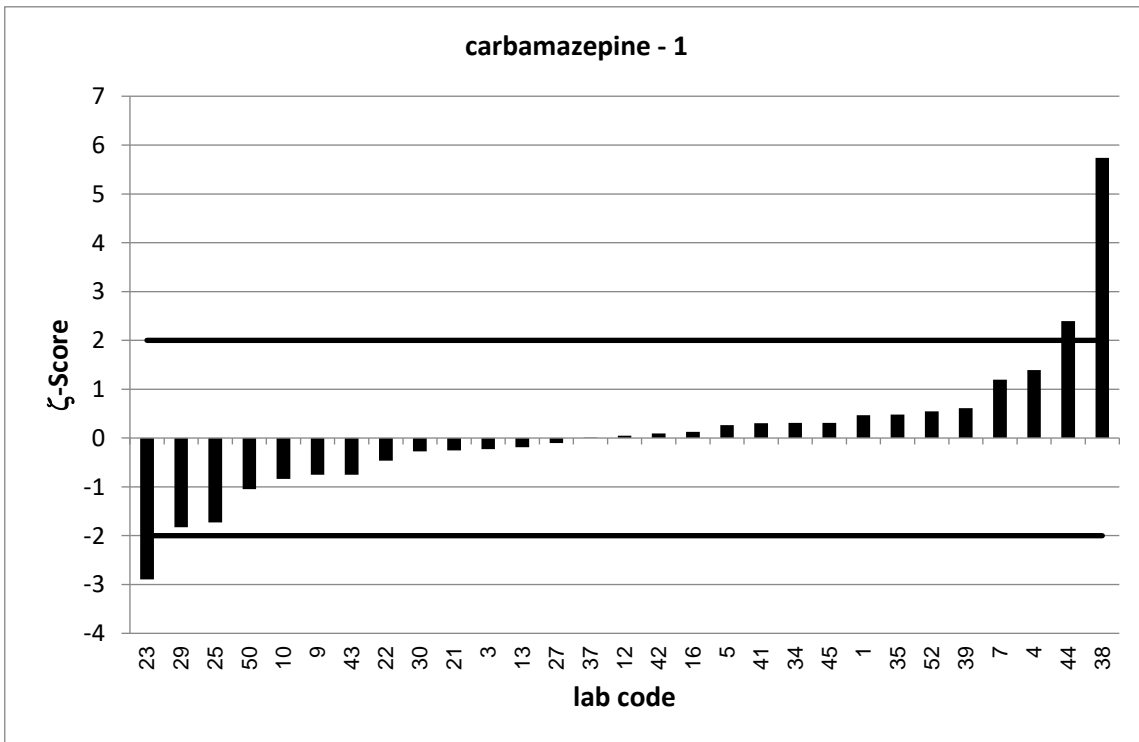


Strongly deviating values are not shown in the diagram.





Strongly deviating values are not correctly shown in the diagram.

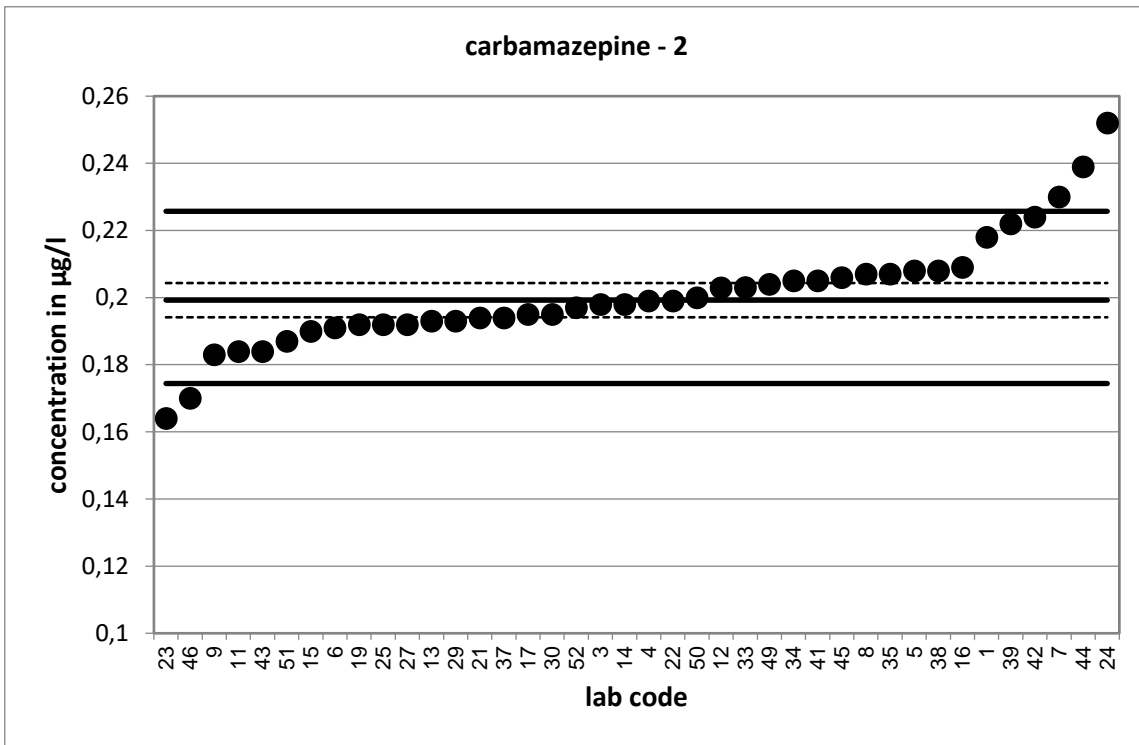




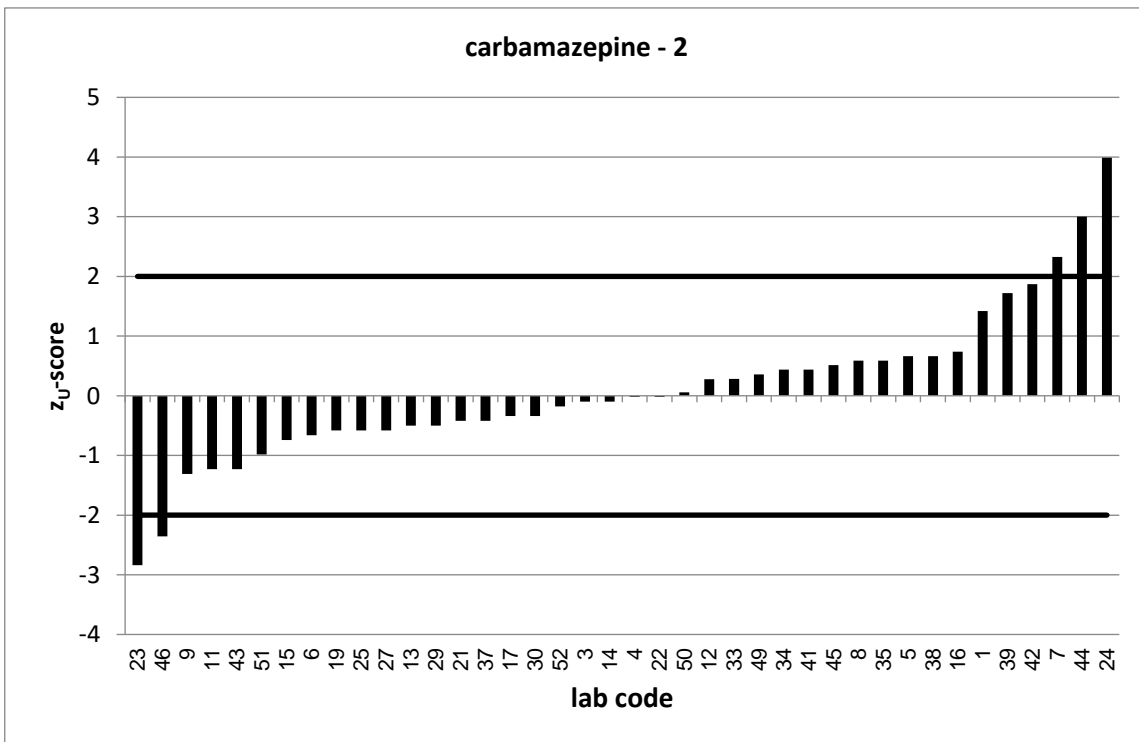
PT 4/23 - TW S2		carbamazepine - 2			
assigned value [ $\mu\text{g/l}$ ]*		0,1992 $\pm$ 0,0051			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,2257			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,1744			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,218	0,087	0,4	1,4	s
3	0,198	0,05	0,0	-0,1	s
4	0,199	0,05	0,0	0,0	s
5	0,208	0,05	0,3	0,7	s
6	0,191			-0,7	s
7	0,23	0,05	1,2	2,3	q
8	0,207			0,6	s
9	0,183	0,024	-1,3	-1,3	s
11	0,184			-1,2	s
12	0,2029	0,057	0,1	0,3	s
13	0,193	0,097	-0,1	-0,5	s
14	0,198			-0,1	s
15	0,19			-0,7	s
16	0,209	0,066	0,3	0,7	s
17	0,195			-0,3	s
19	0,192			-0,6	s
21	0,194	0,026	-0,4	-0,4	s
22	0,199	0,03	0,0	0,0	s
23	0,164	0,031	-2,2	-2,8	q
24	0,252			4,0	u
25	0,192	0,006	-1,8	-0,6	s
27	0,192	0,089	-0,2	-0,6	s
29	0,193	0,005	-1,8	-0,5	s
30	0,195	0,096	-0,1	-0,3	s
33	0,203			0,3	s
34	0,205	0,051	0,2	0,4	s
35	0,207	0,008	1,6	0,6	s
37	0,194	0,058	-0,2	-0,4	s
38	0,208	0,008	1,9	0,7	s
39	0,222	0,066	0,7	1,7	s
41	0,205	0,04	0,3	0,4	s
42	0,224	0,095	0,5	1,9	s
43	0,184	0,037	-0,8	-1,2	s
44	0,239	0,05	1,6	3,0	u
45	0,206	0,062	0,2	0,5	s
46	0,17			-2,4	q
49	0,204			0,4	s
50	0,2	0,034	0,0	0,1	s
51	0,187			-1,0	s
52	0,197	0,009	-0,4	-0,2	s

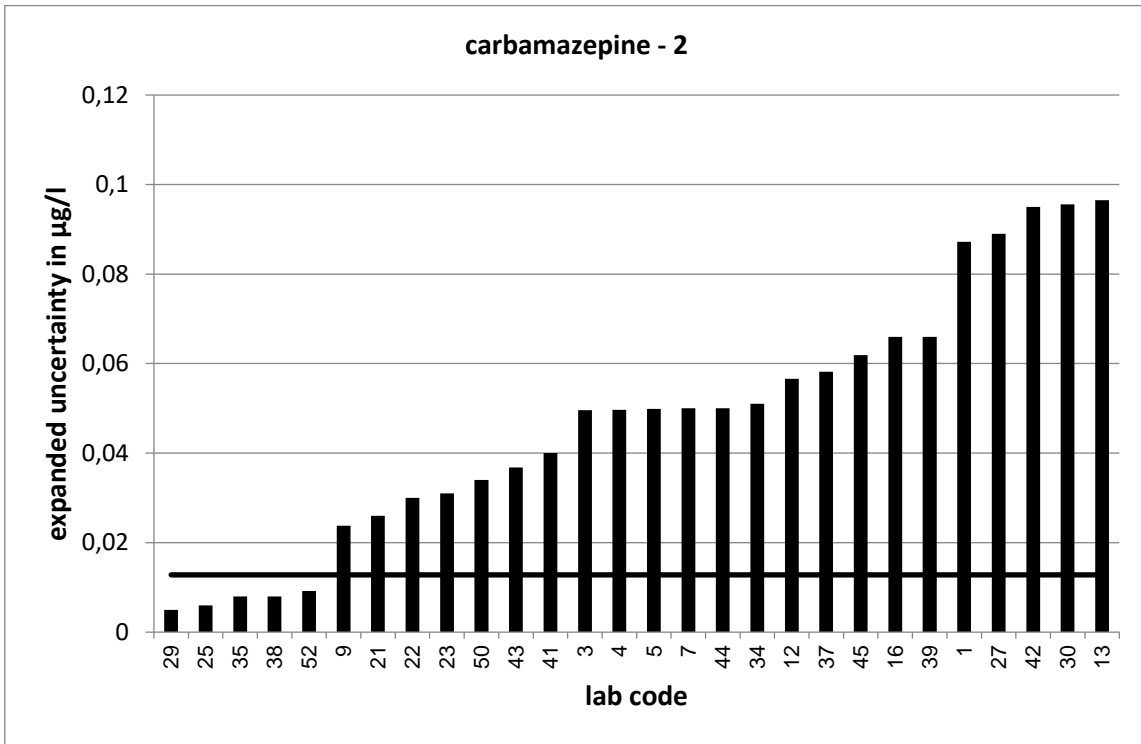
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

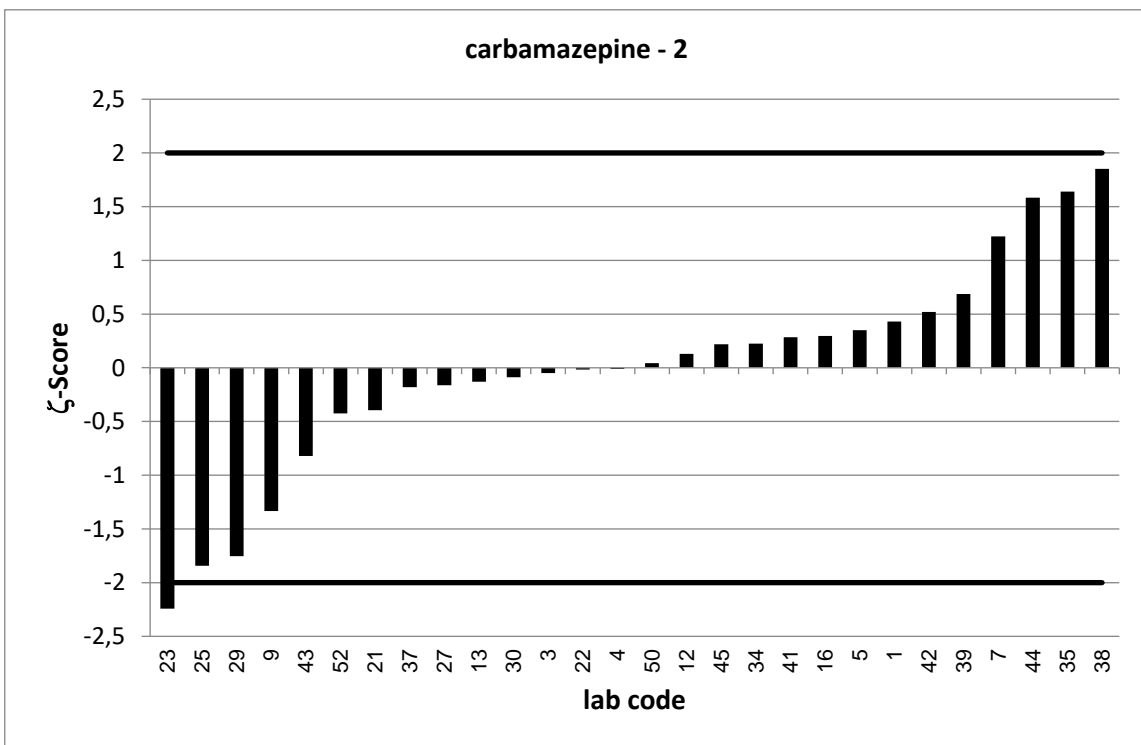


Strongly deviating values are not shown in the diagram.





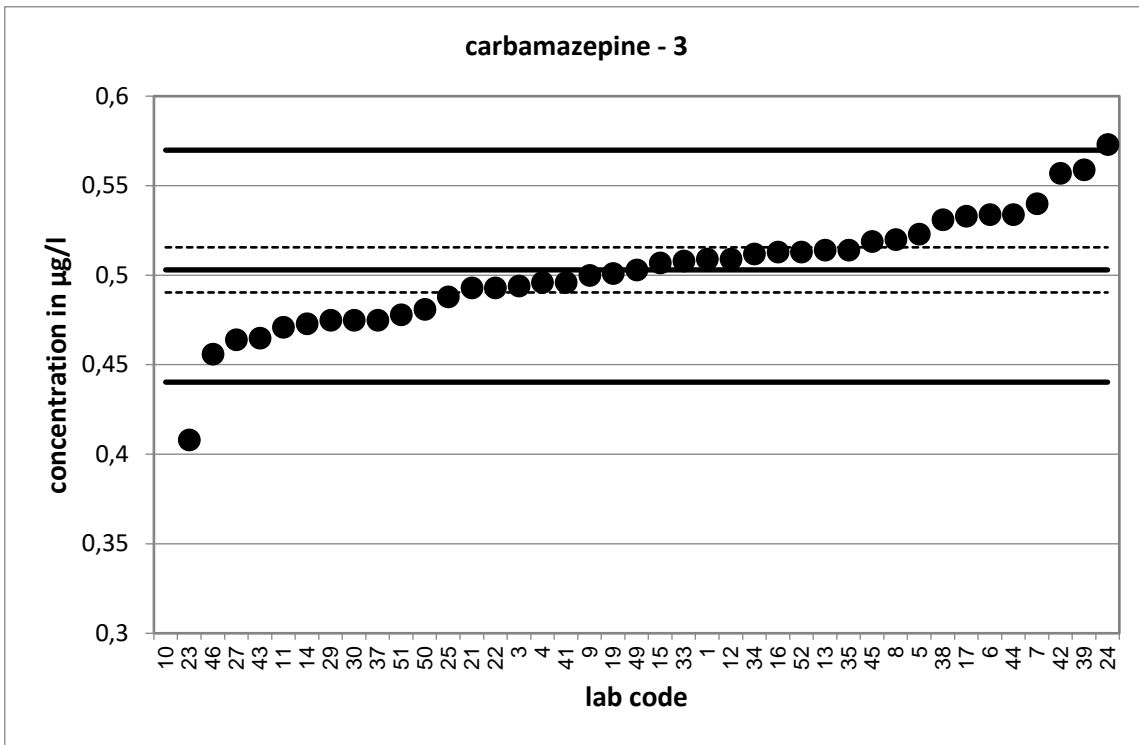
Strongly deviating values are not correctly shown in the diagram.



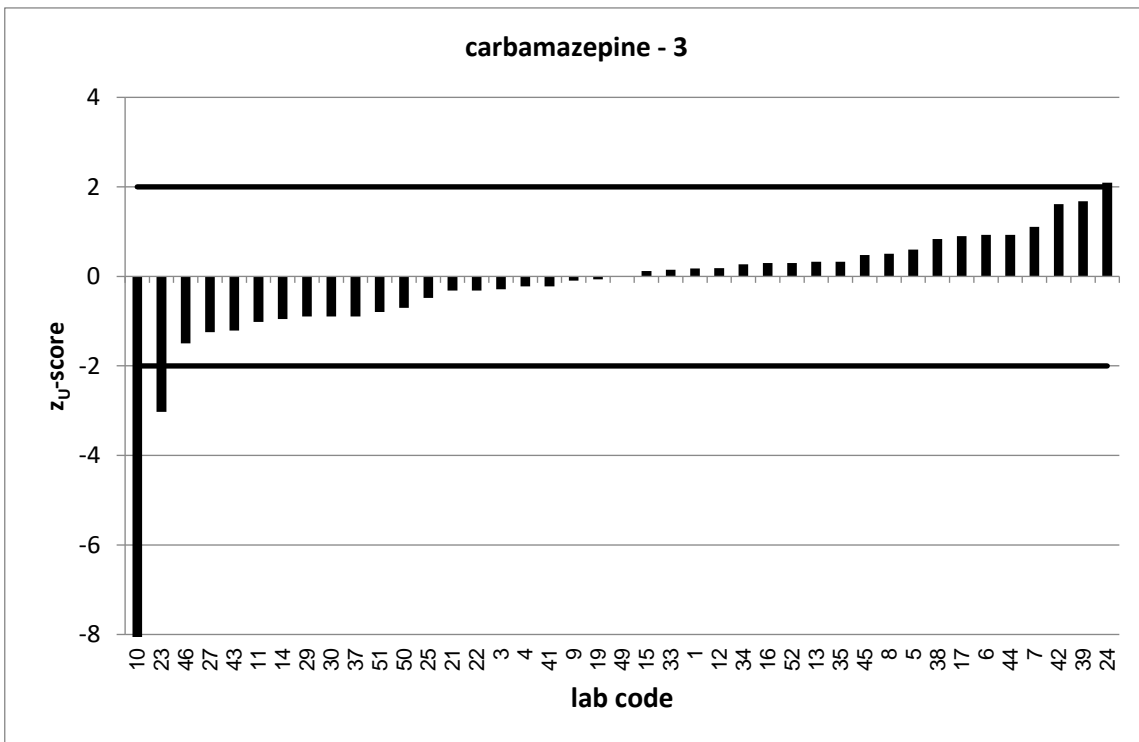
PT 4/23 - TW S2		carbamazepine - 3			
assigned value [ $\mu\text{g/l}$ ]*		0,503 $\pm$ 0,0126			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,5698			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,4403			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,509	0,204	0,1	0,2	s
3	0,494	0,124	-0,1	-0,3	s
4	0,496	0,124	-0,1	-0,2	s
5	0,523	0,126	0,3	0,6	s
6	0,534			0,9	s
7	0,54	0,1	0,7	1,1	s
8	0,52			0,5	s
9	0,5	0,065	-0,1	-0,1	s
10	0,2	0,06	-9,9	-9,7	u
11	0,471			-1,0	s
12	0,5091	0,142	0,1	0,2	s
13	0,514	0,257	0,1	0,3	s
14	0,473			-1,0	s
15	0,507			0,1	s
16	0,513	0,162	0,1	0,3	s
17	0,533			0,9	s
19	0,501			-0,1	s
21	0,493	0,065	-0,3	-0,3	s
22	0,493	0,074	-0,3	-0,3	s
23	0,408	0,077	-2,4	-3,0	u
24	0,573			2,1	q
25	0,488	0,01	-1,9	-0,5	s
27	0,464	0,215	-0,4	-1,2	s
29	0,475	0,005	-4,1	-0,9	s
30	0,475	0,233	-0,2	-0,9	s
33	0,508			0,2	s
34	0,512	0,13	0,1	0,3	s
35	0,514	0,023	0,8	0,3	s
37	0,475	0,143	-0,4	-0,9	s
38	0,531	0,02	2,4	0,8	s
39	0,559	0,165	0,7	1,7	s
41	0,496	0,12	-0,1	-0,2	s
42	0,557	0,237	0,5	1,6	s
43	0,465	0,093	-0,8	-1,2	s
44	0,534	0,1	0,6	0,9	s
45	0,519	0,156	0,2	0,5	s
46	0,456			-1,5	s
49	0,503			0,0	s
50	0,481	0,082	-0,5	-0,7	s
51	0,478			-0,8	s
52	0,513	0,015	1,0	0,3	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

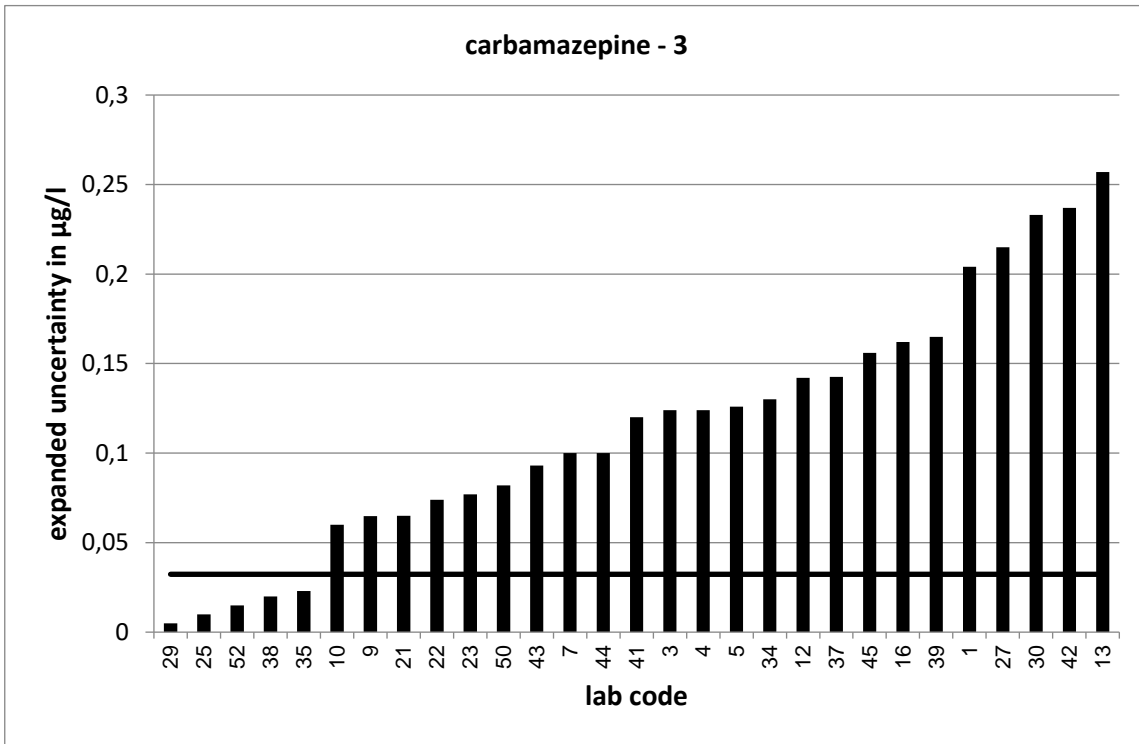
\*\* s = satisfactory, q = questionable, u = unsatisfactory



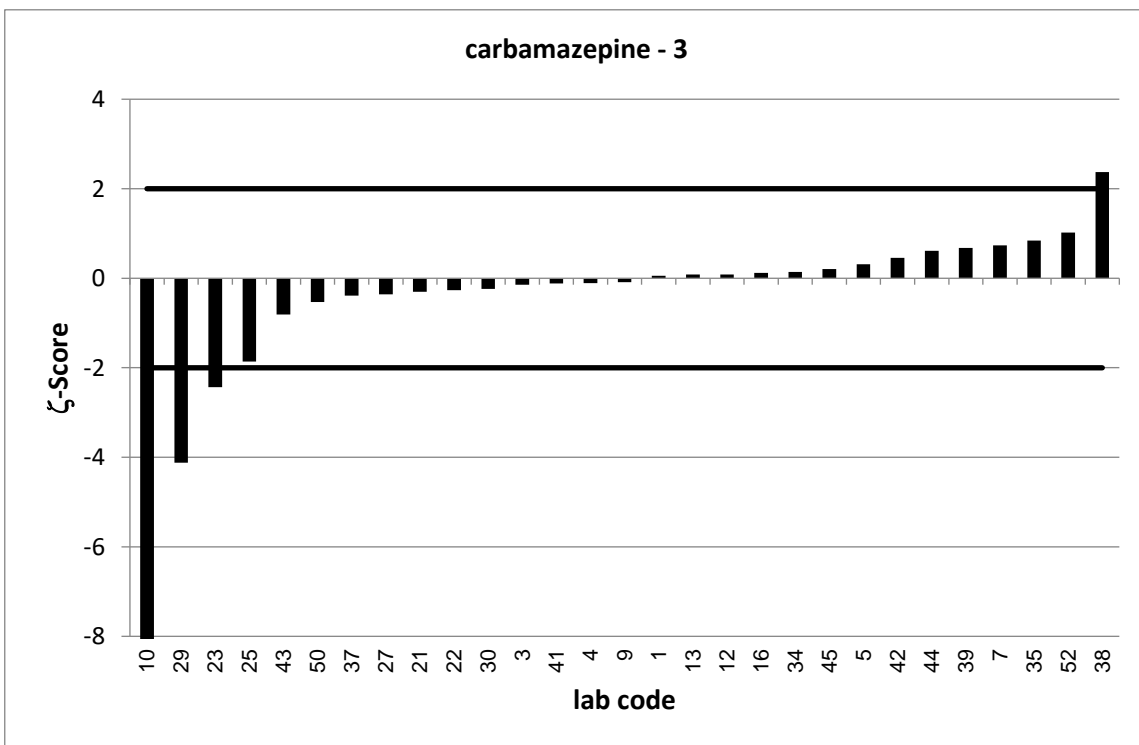
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.

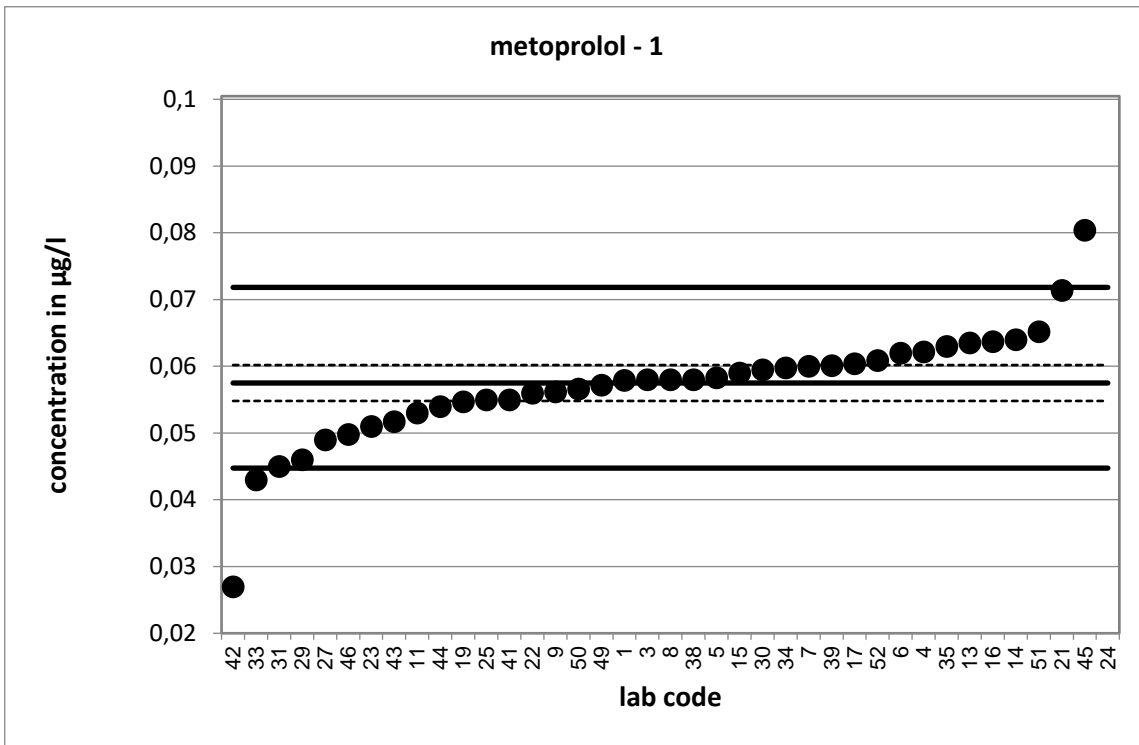


Strongly deviating values are not correctly shown in the diagram.

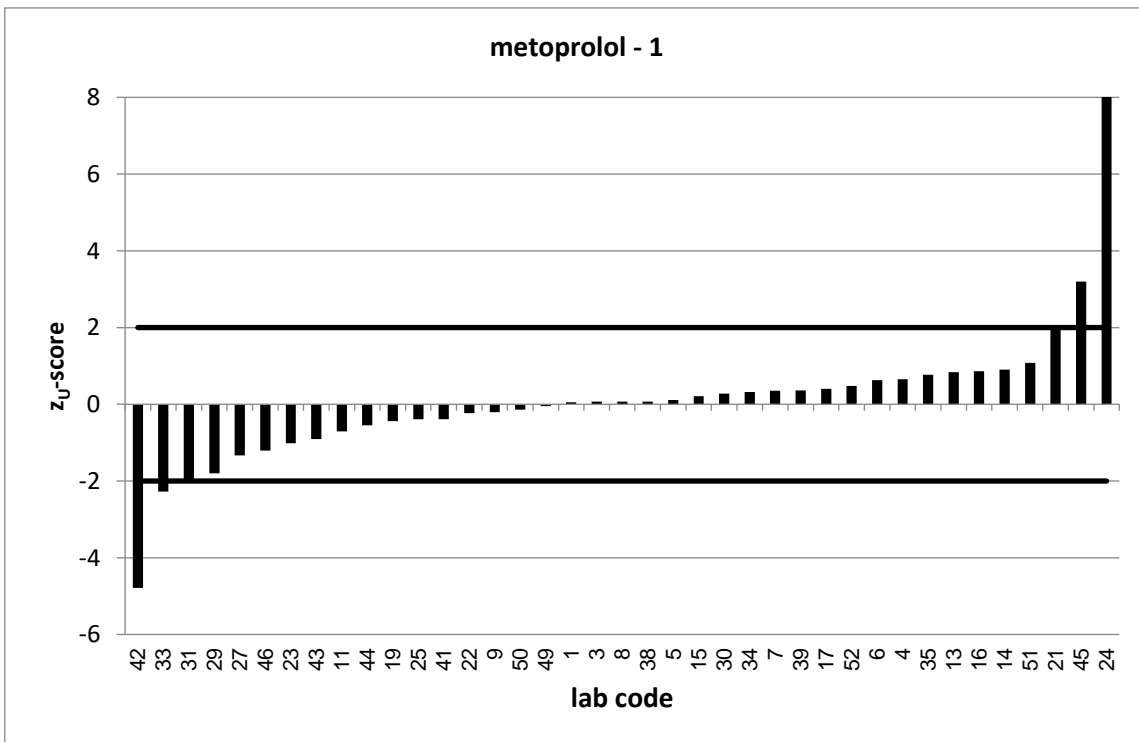
PT 4/23 - TW S2		metoprolol - 1			
assigned value [ $\mu\text{g/l}$ ]*		0,0575 $\pm$ 0,00269			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,07182			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,04475			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,0579	0,023	0,0	0,1	s
3	0,058	0,015	0,1	0,1	s
4	0,0622	0,019	0,5	0,7	s
5	0,0583	0,023	0,1	0,1	s
6	0,062			0,6	s
7	0,06	0,01	0,5	0,3	s
8	0,058			0,1	s
9	0,0562	0,008	-0,3	-0,2	s
11	0,053			-0,7	s
13	0,0635	0,032	0,4	0,8	s
14	0,064			0,9	s
15	0,059			0,2	s
16	0,0637	0,017	0,7	0,9	s
17	0,0604			0,4	s
19	0,0547			-0,4	s
21	0,0714	0,021	1,3	1,9	s
22	0,056	0,008	-0,4	-0,2	s
23	0,051	0,011	-1,1	-1,0	s
24	0,2			19,9	u
25	0,055	0,005	-0,9	-0,4	s
27	0,049	0,022	-0,8	-1,3	s
29	0,046	0,003	-5,7	-1,8	s
30	0,0595	0,035	0,1	0,3	s
31	0,045			-2,0	s
33	0,043			-2,3	q
34	0,0598	0,015	0,3	0,3	s
35	0,063	0,005	1,9	0,8	s
38	0,058	0,003	0,3	0,1	s
39	0,0601	0,011	0,4	0,4	s
41	0,055	0,02	-0,2	-0,4	s
42	0,027	0,008	-7,2	-4,8	u
43	0,0517	0,018	-0,6	-0,9	s
44	0,054	0,01	-0,7	-0,5	s
45	0,0804	0,024	1,9	3,2	u
46	0,0498			-1,2	s
49	0,0572			0,0	s
50	0,0566	0,019	-0,1	-0,1	s
51	0,0652			1,1	s
52	0,0609	0,015	0,4	0,5	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

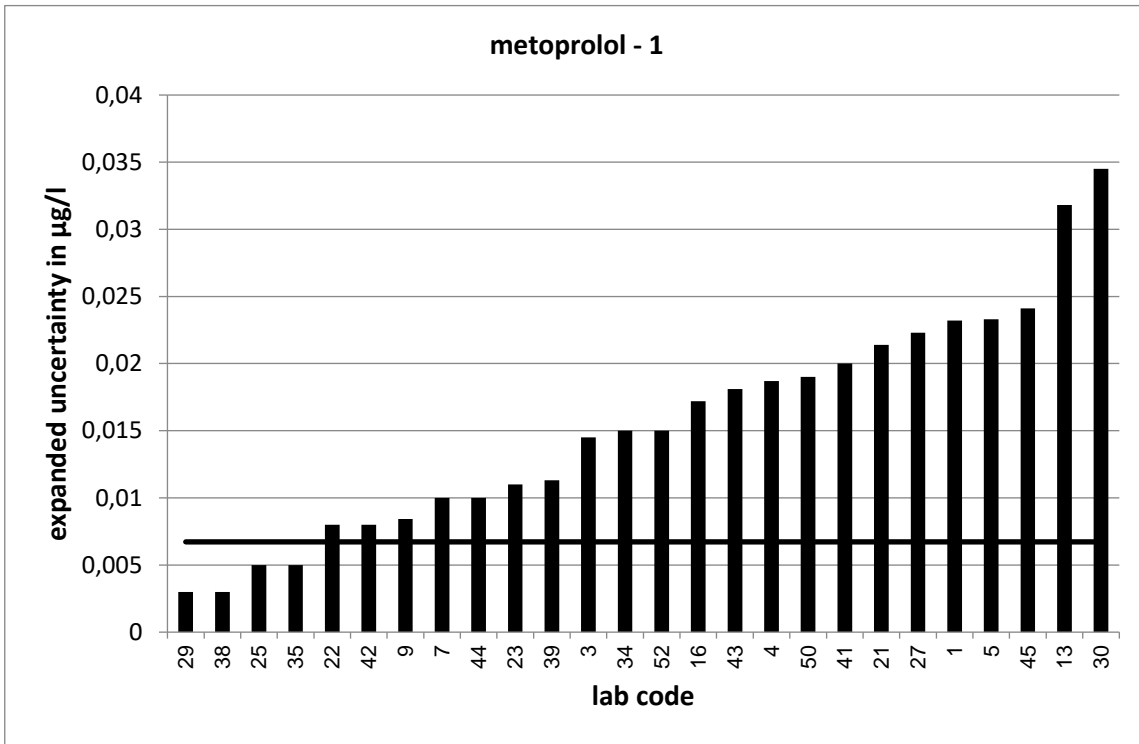


Strongly deviating values are not shown in the diagram.

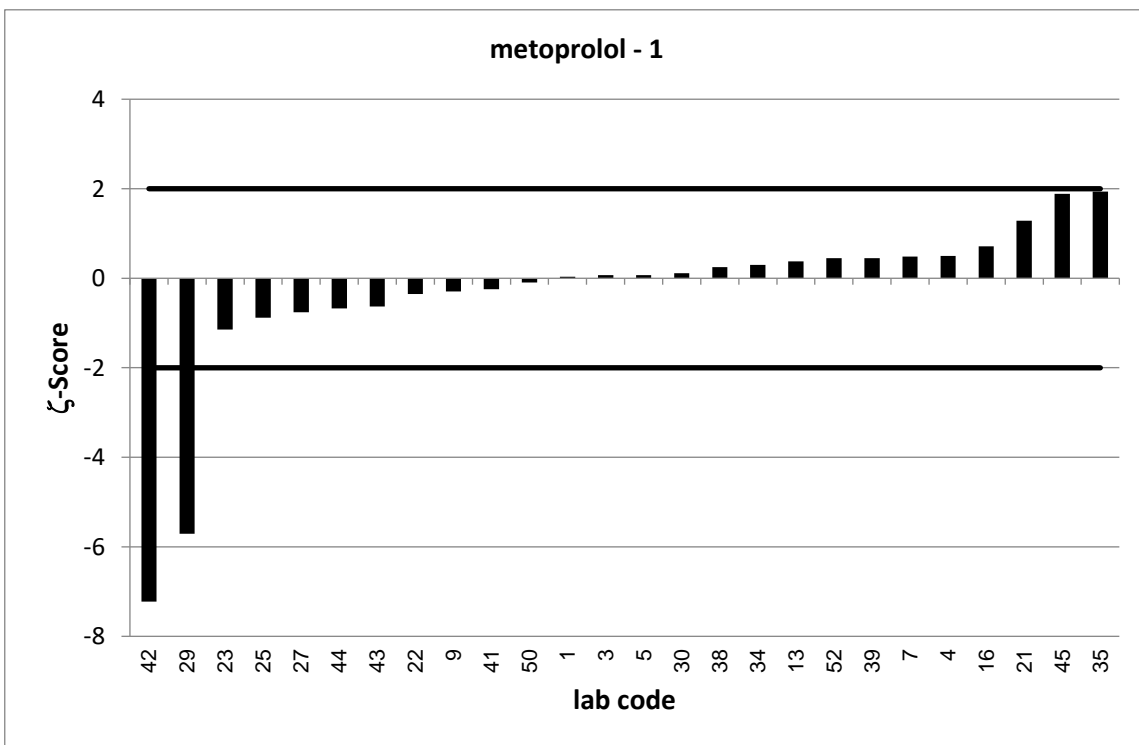


Strongly deviating values are not correctly shown in the diagram.





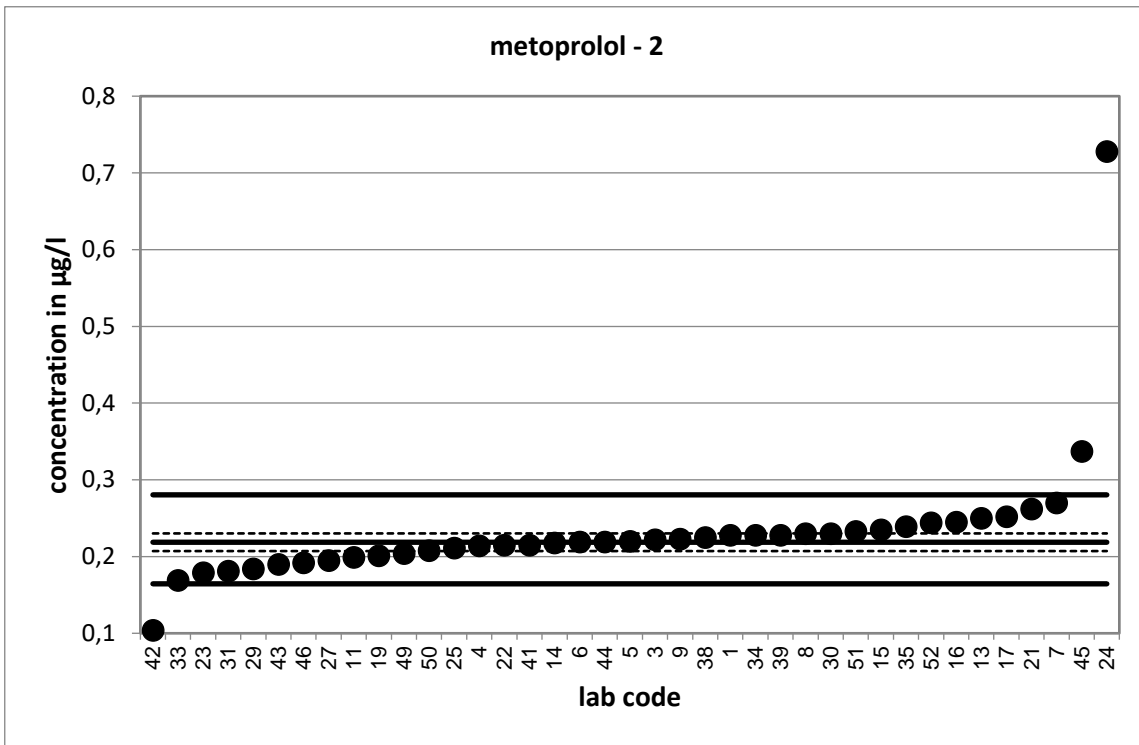
Strongly deviating values are not correctly shown in the diagram.



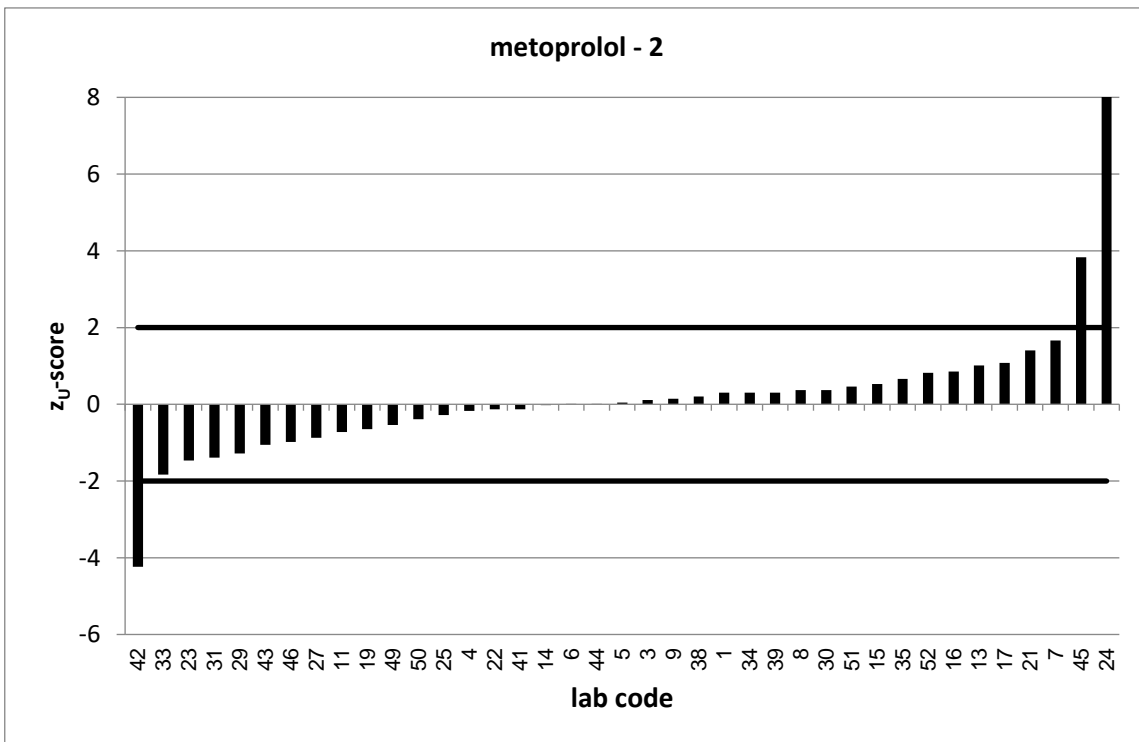
PT 4/23 - TW S2		metoprolol - 2			
assigned value [ $\mu\text{g/l}$ ]*		0,2186 $\pm$ 0,0115			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,2804			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,1645			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,228	0,091	0,2	0,3	s
3	0,222	0,056	0,1	0,1	s
4	0,214	0,064	-0,1	-0,2	s
5	0,22	0,088	0,0	0,0	s
6	0,219			0,0	s
7	0,27	0,05	2,0	1,7	s
8	0,23			0,4	s
9	0,223	0,033	0,2	0,1	s
11	0,199			-0,7	s
13	0,25	0,125	0,5	1,0	s
14	0,218			0,0	s
15	0,235			0,5	s
16	0,245	0,066	0,8	0,9	s
17	0,252			1,1	s
19	0,201			-0,7	s
21	0,262	0,079	1,1	1,4	s
22	0,215	0,032	-0,2	-0,1	s
23	0,179	0,038	-2,0	-1,5	s
24	0,728			16,5	u
25	0,211	0,017	-0,7	-0,3	s
27	0,195	0,89	-0,1	-0,9	s
29	0,184	0,003	-5,8	-1,3	s
30	0,23	0,133	0,2	0,4	s
31	0,181			-1,4	s
33	0,169			-1,8	s
34	0,228	0,057	0,3	0,3	s
35	0,239	0,02	1,8	0,7	s
38	0,225	0,012	0,8	0,2	s
39	0,228	0,043	0,4	0,3	s
41	0,215	0,04	-0,2	-0,1	s
42	0,104	0,032	-6,7	-4,2	u
43	0,19	0,067	-0,8	-1,1	s
44	0,219	0,04	0,0	0,0	s
45	0,337	0,101	2,3	3,8	u
46	0,192			-1,0	s
49	0,204			-0,5	s
50	0,208	0,073	-0,3	-0,4	s
51	0,233			0,5	s
52	0,244	0,024	1,9	0,8	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

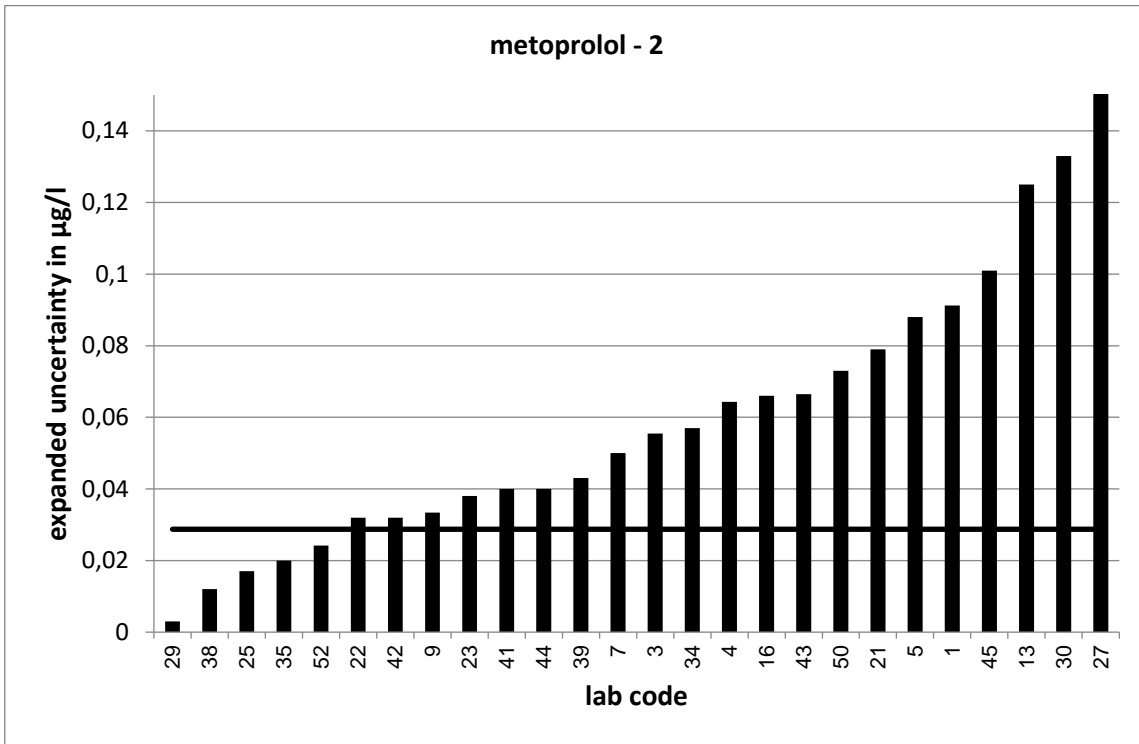
\*\* s = satisfactory, q = questionable, u = unsatisfactory



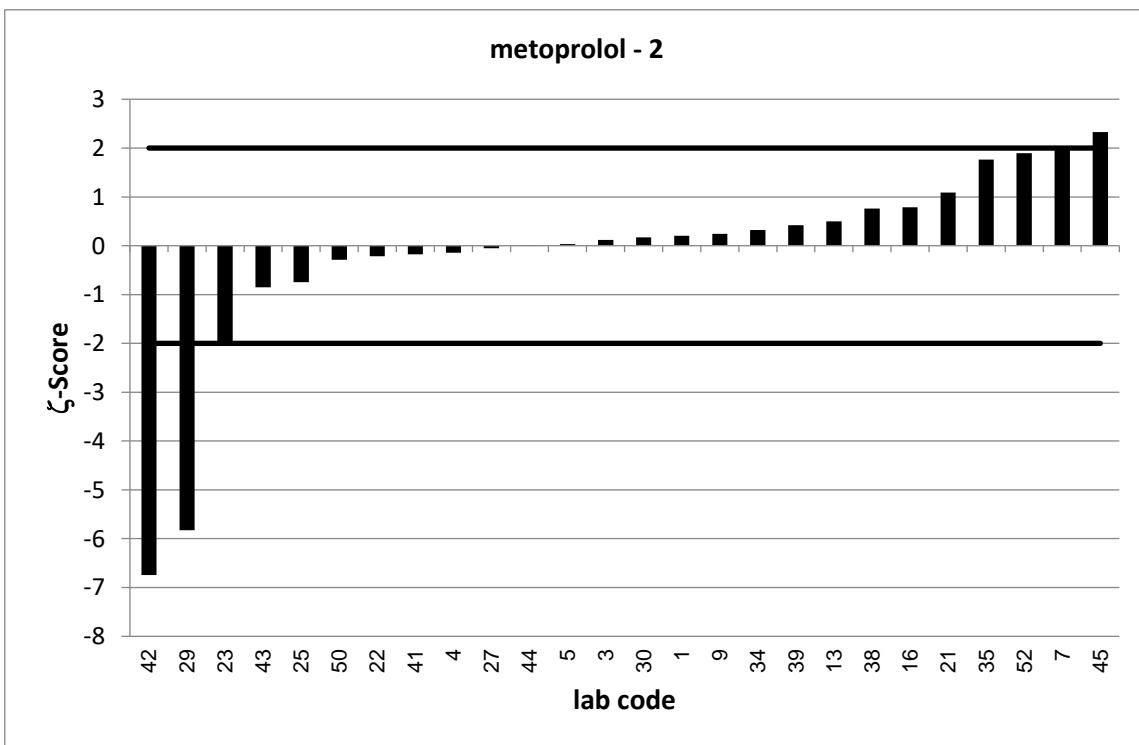
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



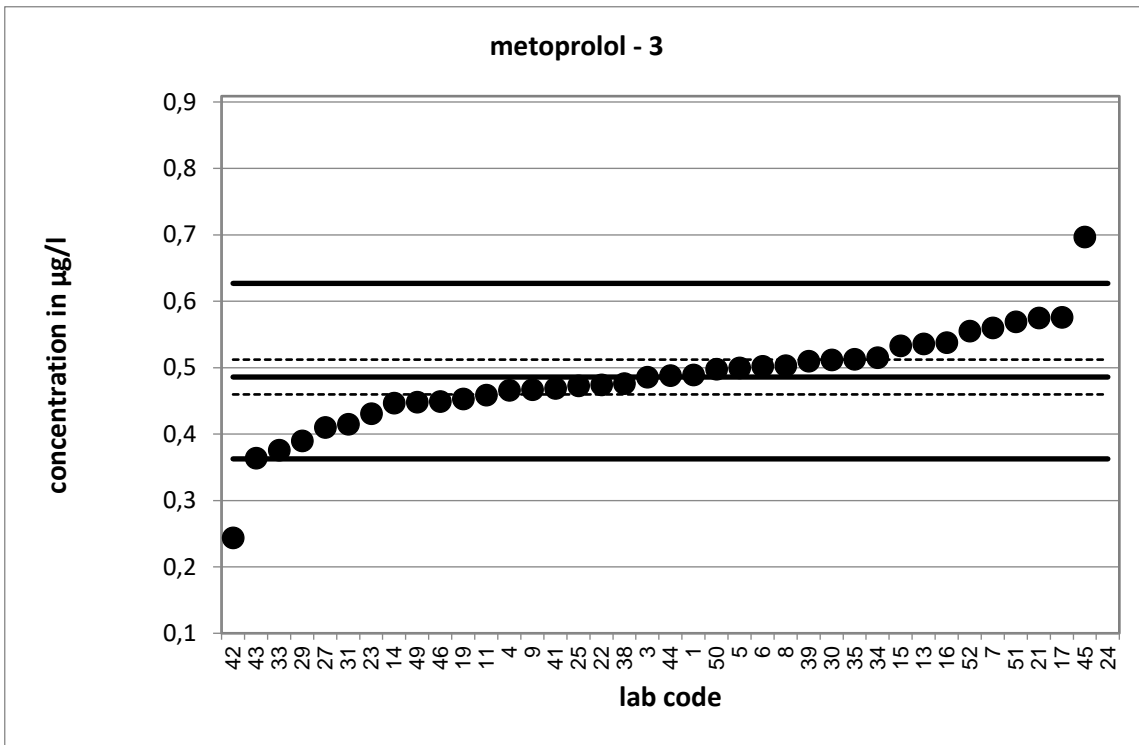
Strongly deviating values are not correctly shown in the diagram.



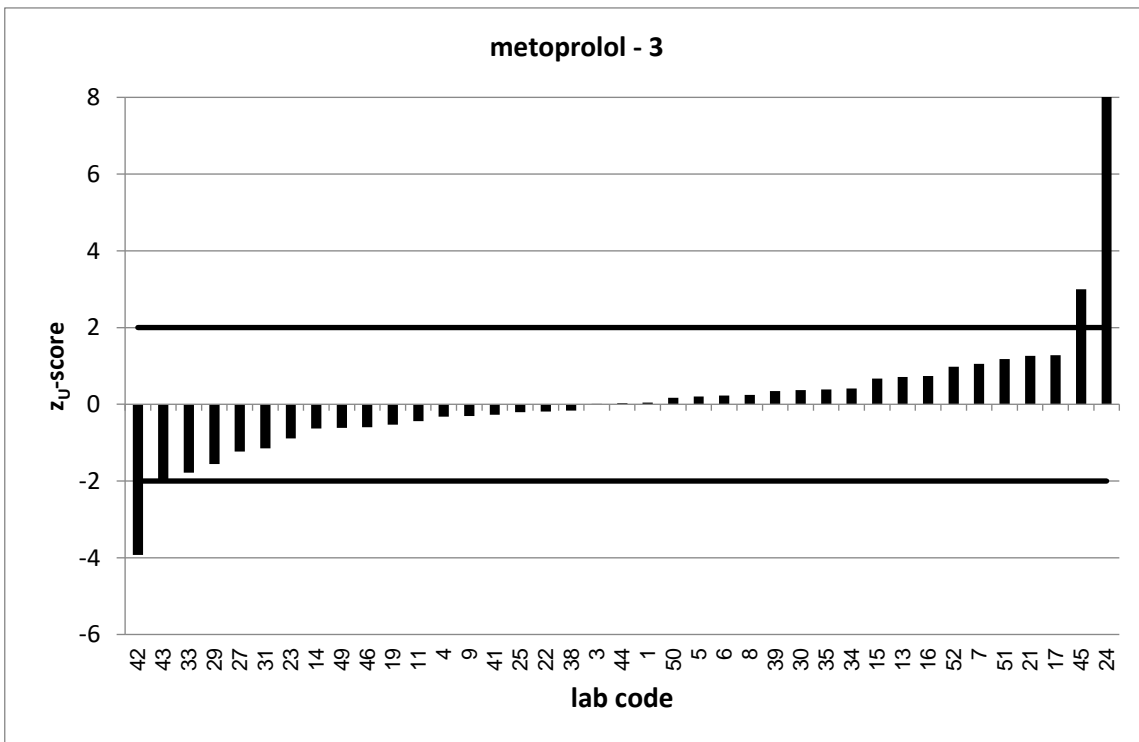
PT 4/23 - TW S2		metoprolol - 3			
assigned value [ $\mu\text{g/l}$ ]*		0,4859 $\pm$ 0,0262			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,6268			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,3626			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,489	0,196	0,0	0,0	s
3	0,486	0,121	0,0	0,0	s
4	0,466	0,14	-0,3	-0,3	s
5	0,5	0,2	0,1	0,2	s
6	0,502			0,2	s
7	0,56	0,11	1,3	1,1	s
8	0,503			0,2	s
9	0,467	0,07	-0,5	-0,3	s
11	0,459			-0,4	s
13	0,536	0,268	0,4	0,7	s
14	0,447			-0,6	s
15	0,533			0,7	s
16	0,538	0,145	0,7	0,7	s
17	0,576			1,3	s
19	0,453			-0,5	s
21	0,575	0,173	1,0	1,3	s
22	0,474	0,071	-0,3	-0,2	s
23	0,431	0,093	-1,1	-0,9	s
24	1,941			20,6	u
25	0,473	0,009	-0,9	-0,2	s
27	0,41	0,187	-0,8	-1,2	s
29	0,39	0,003	-7,3	-1,6	s
30	0,512	0,297	0,2	0,4	s
31	0,415			-1,1	s
33	0,376			-1,8	s
34	0,515	0,13	0,4	0,4	s
35	0,513	0,046	1,0	0,4	s
38	0,476	0,026	-0,5	-0,2	s
39	0,51	0,096	0,5	0,3	s
41	0,469	0,08	-0,4	-0,3	s
42	0,244	0,075	-6,1	-3,9	u
43	0,364	0,127	-1,9	-2,0	s
44	0,488	0,1	0,0	0,0	s
45	0,697	0,209	2,0	3,0	u
46	0,449			-0,6	s
49	0,448			-0,6	s
50	0,498	0,164	0,1	0,2	s
51	0,569			1,2	s
52	0,555	0,027	3,7	1,0	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

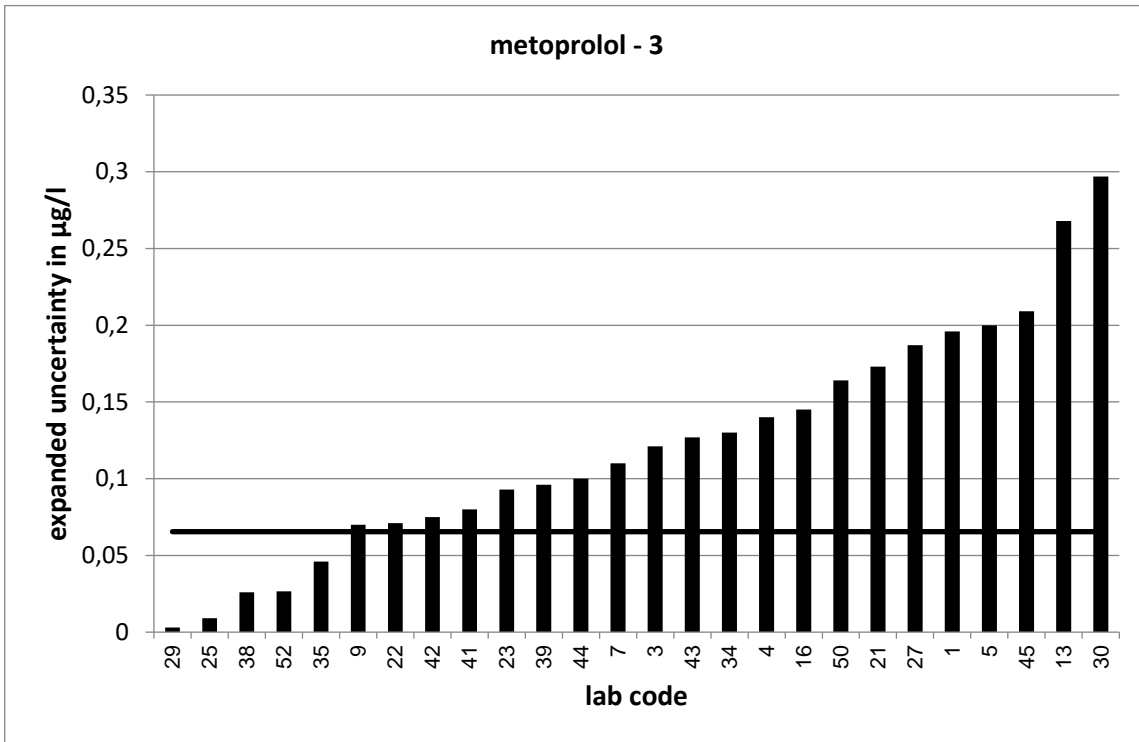
\*\* s = satisfactory, q = questionable, u = unsatisfactory



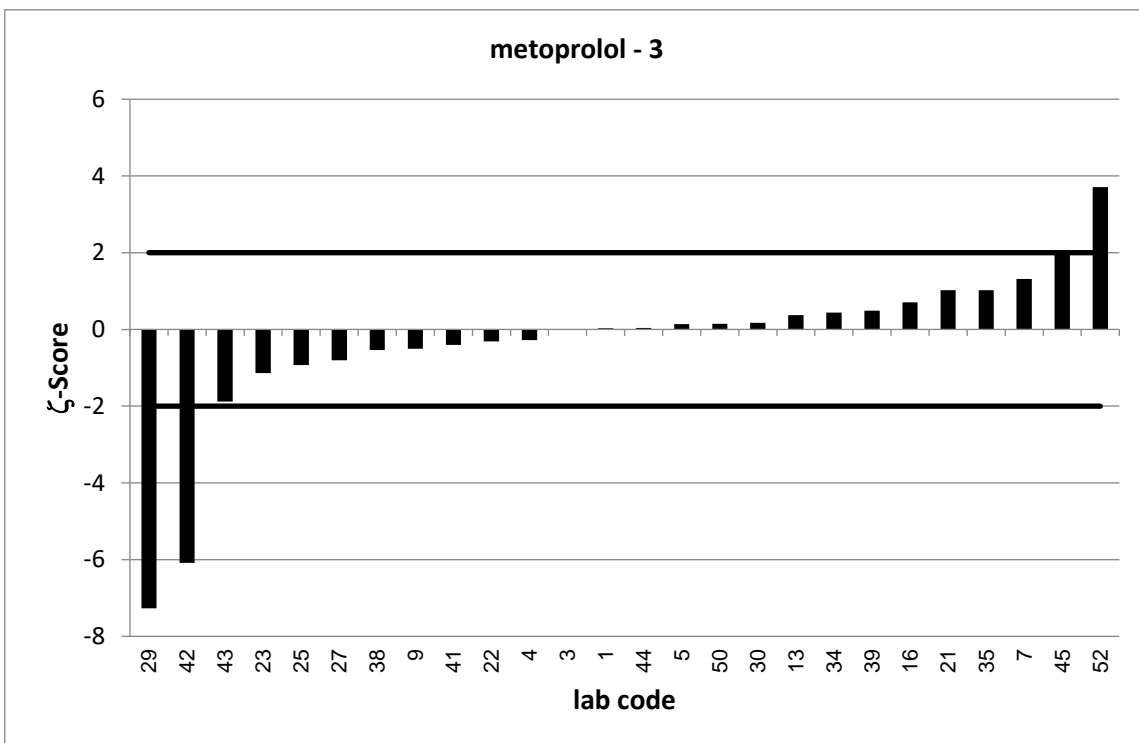
Strongly deviating values are not shown in the diagram.



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Strongly deviating values are not correctly shown in the diagram.

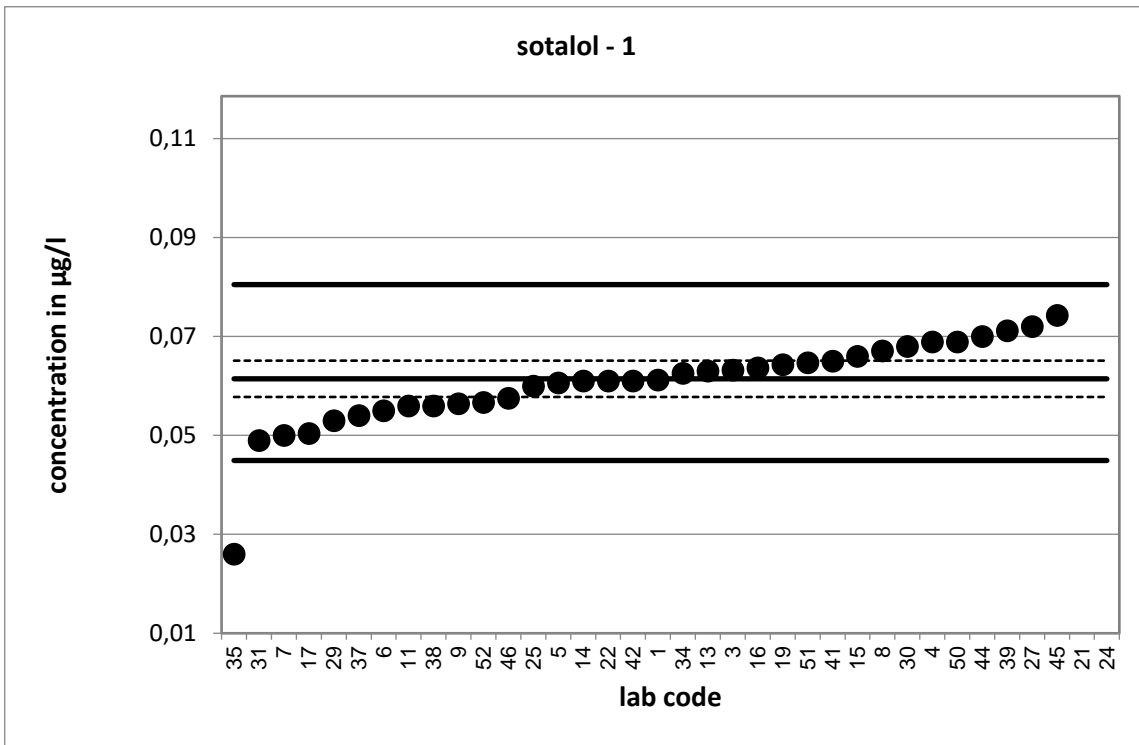


PT 4/23 - TW S2		sotalol - 1			
assigned value [ $\mu\text{g/l}$ ]*		0,06144 $\pm$ 0,00367			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,08049			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,04493			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,0612	0,012	0,0	0,0	s
3	0,0632	0,016	0,2	0,2	s
4	0,0689	0,024	0,6	0,8	s
5	0,0606	0,041	0,0	-0,1	s
6	0,055			-0,8	s
7	0,05	0,01	-2,1	-1,4	s
8	0,0671			0,6	s
9	0,0564	0,007	-1,3	-0,6	s
11	0,056			-0,7	s
13	0,063	0,032	0,1	0,2	s
14	0,061			-0,1	s
15	0,066			0,5	s
16	0,0637	0,013	0,3	0,2	s
17	0,0504			-1,3	s
19	0,0643			0,3	s
21	0,122	0,037	3,3	6,4	u
22	0,061	0,009	-0,1	-0,1	s
24	0,236			18,3	u
25	0,06	0,002	-0,7	-0,2	s
27	0,072	0,031	0,7	1,1	s
29	0,053	0,005	-2,7	-1,0	s
30	0,068	0,02	0,7	0,7	s
31	0,049			-1,5	s
34	0,0626	0,016	0,1	0,1	s
35	0,026	0,003	-15,0	-4,3	u
37	0,054	0,016	-0,9	-0,9	s
38	0,056	0,002	-2,6	-0,7	s
39	0,0712	0,024	0,8	1,0	s
41	0,065	0,02	0,4	0,4	s
42	0,061	0,217	0,0	-0,1	s
44	0,07	0,02	0,8	0,9	s
45	0,0743	0,08	0,3	1,4	s
46	0,0575			-0,5	s
50	0,0689	0,015	1,0	0,8	s
51	0,0647			0,3	s
52	0,0567	0,007	-1,2	-0,6	s

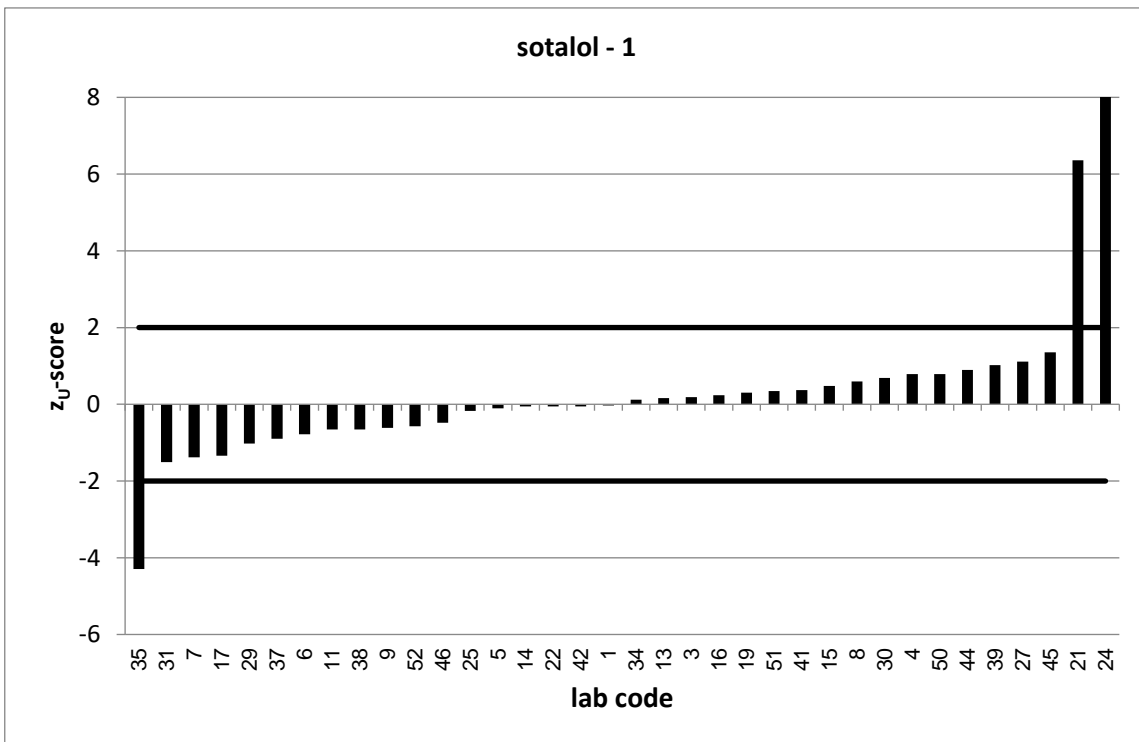
\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

\*\* s = satisfactory, q = questionable, u = unsatisfactory

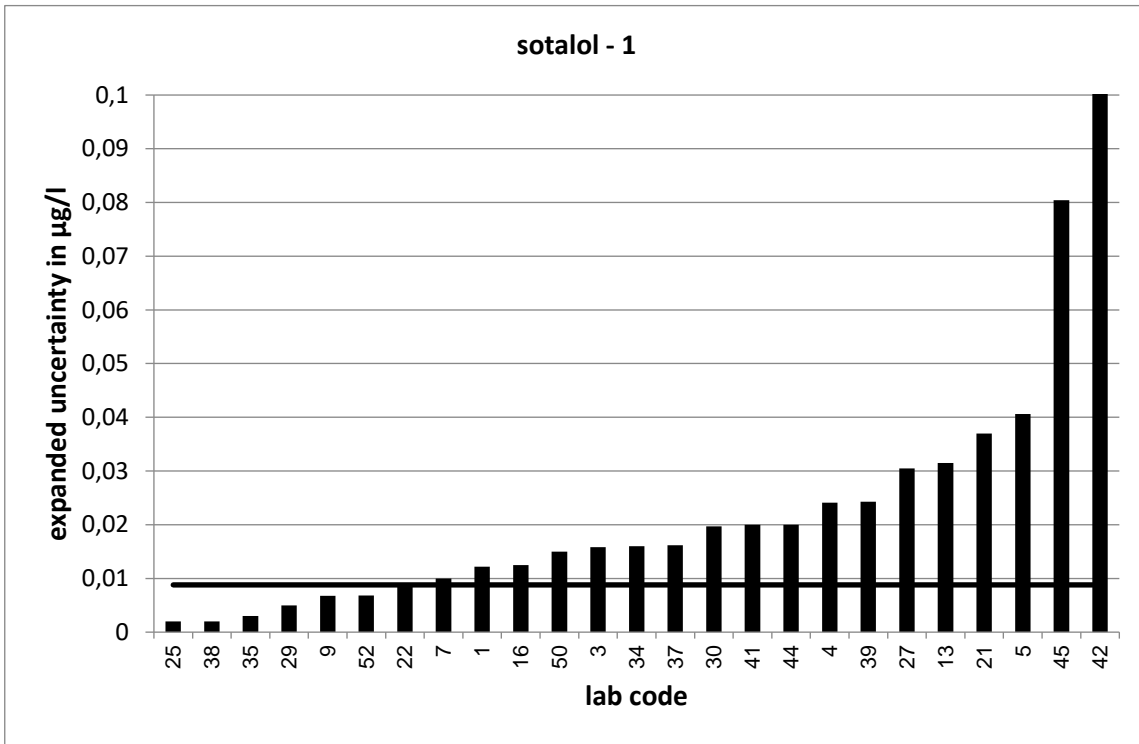




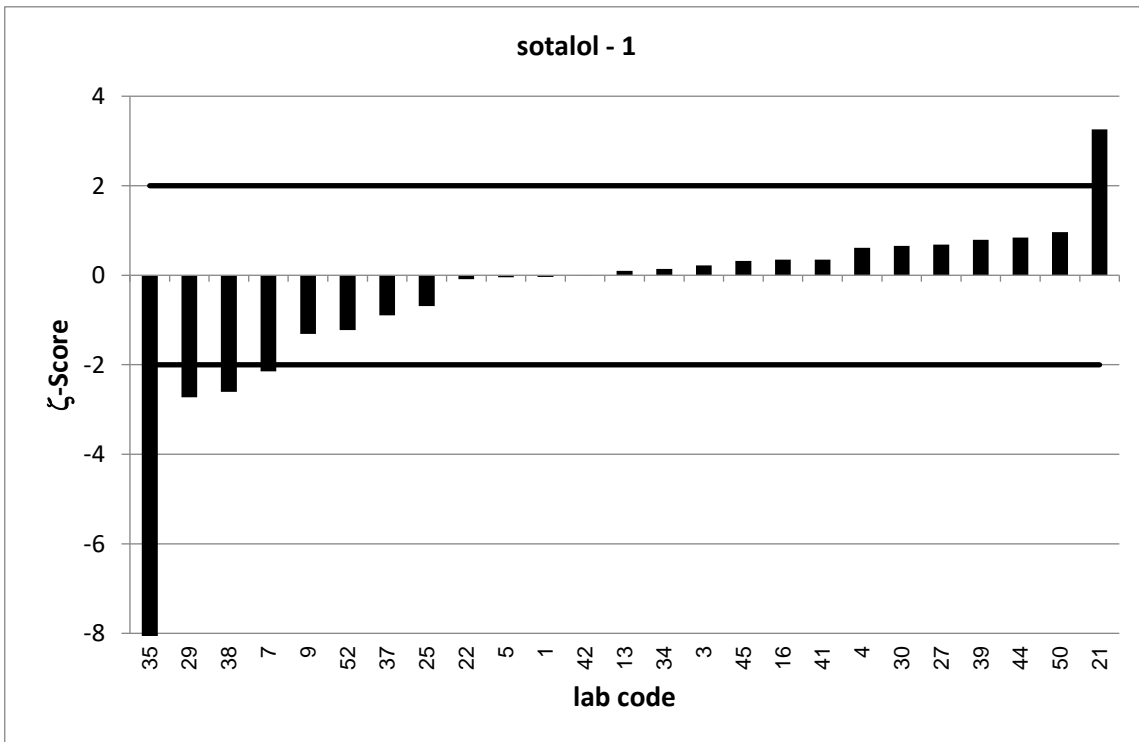
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.

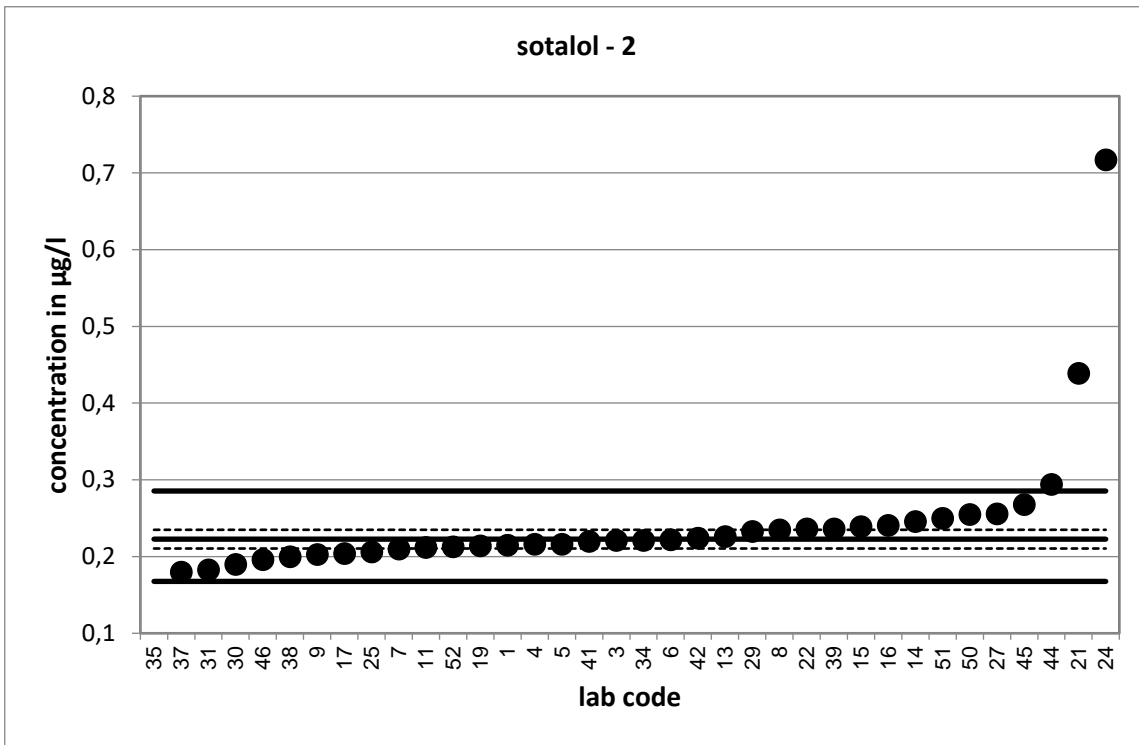


Strongly deviating values are not correctly shown in the diagram.

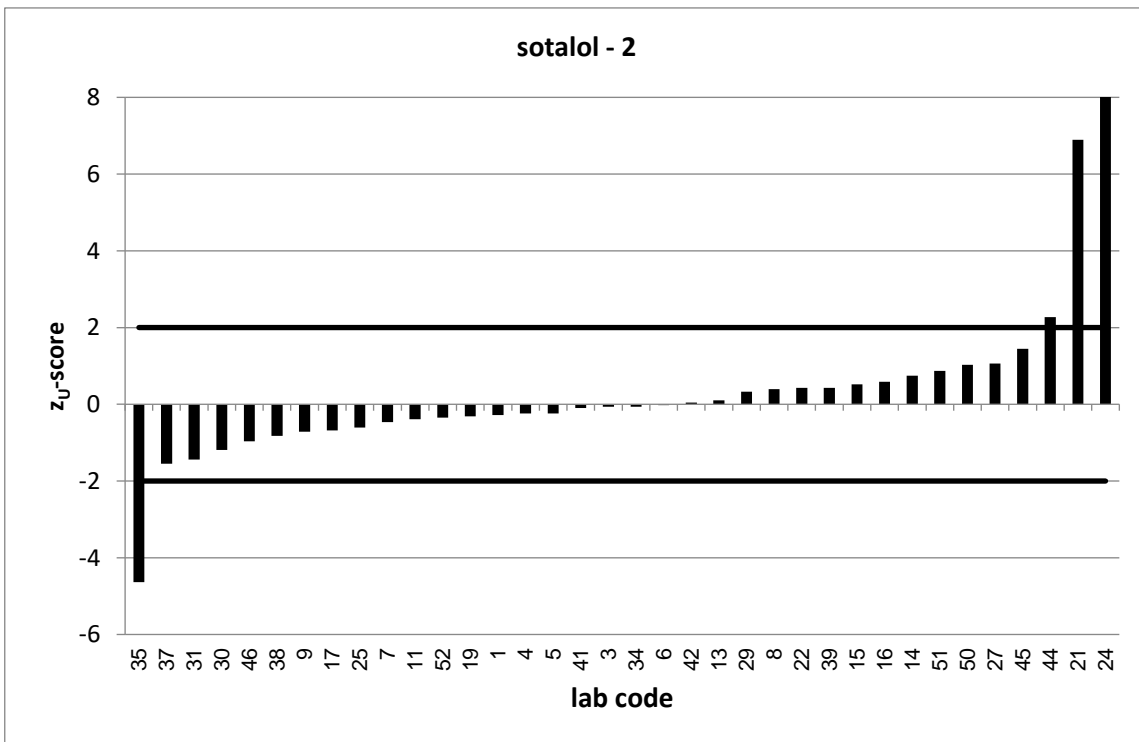
PT 4/23 - TW S2		sotalol - 2			
assigned value [ $\mu\text{g/l}$ ]*		0,2227 $\pm$ 0,0122			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,2854			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,1676			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	$z_U$ -score	assessm.**
1	0,215	0,043	-0,3	-0,3	s
3	0,221	0,055	-0,1	-0,1	s
4	0,216	0,076	-0,2	-0,2	s
5	0,216	0,145	-0,1	-0,2	s
6	0,222			0,0	s
7	0,21	0,04	-0,6	-0,5	s
8	0,235			0,4	s
9	0,203	0,024	-1,4	-0,7	s
11	0,212			-0,4	s
13	0,226	0,113	0,1	0,1	s
14	0,246			0,7	s
15	0,239			0,5	s
16	0,241	0,047	0,8	0,6	s
17	0,204			-0,7	s
19	0,214			-0,3	s
21	0,439	0,132	3,3	6,9	u
22	0,236	0,035	0,7	0,4	s
24	0,717			15,8	u
25	0,206	0,008	-2,3	-0,6	s
27	0,256	0,108	0,6	1,1	s
29	0,233	0,005	1,6	0,3	s
30	0,19	0,055	-1,2	-1,2	s
31	0,183			-1,4	s
34	0,221	0,055	-0,1	-0,1	s
35	0,095	0,015	-13,2	-4,6	u
37	0,18	0,054	-1,5	-1,5	s
38	0,2	0,009	-3,0	-0,8	s
39	0,236	0,08	0,3	0,4	s
41	0,22	0,06	-0,1	-0,1	s
42	0,224	0,08	0,0	0,0	s
44	0,294	0,06	2,3	2,3	q
45	0,268	0,022	3,6	1,4	s
46	0,196			-1,0	s
50	0,255	0,056	1,1	1,0	s
51	0,25			0,9	s
52	0,213	0,013	-1,1	-0,4	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

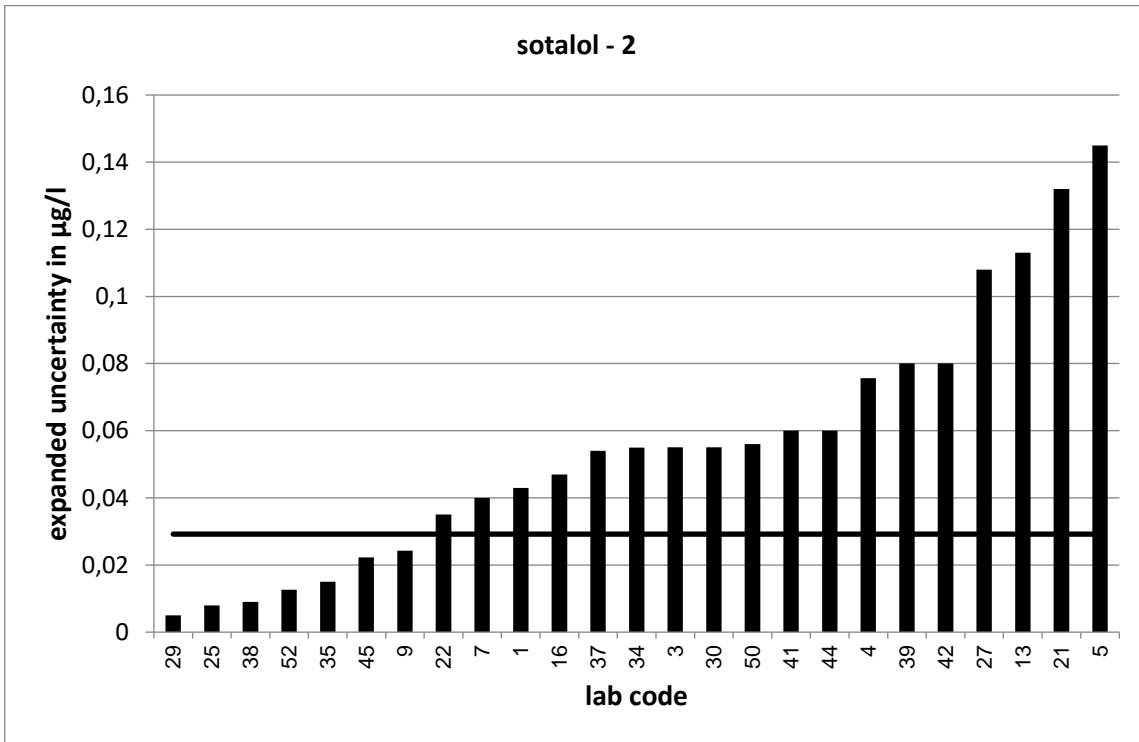
\*\* s = satisfactory, q = questionable, u = unsatisfactory



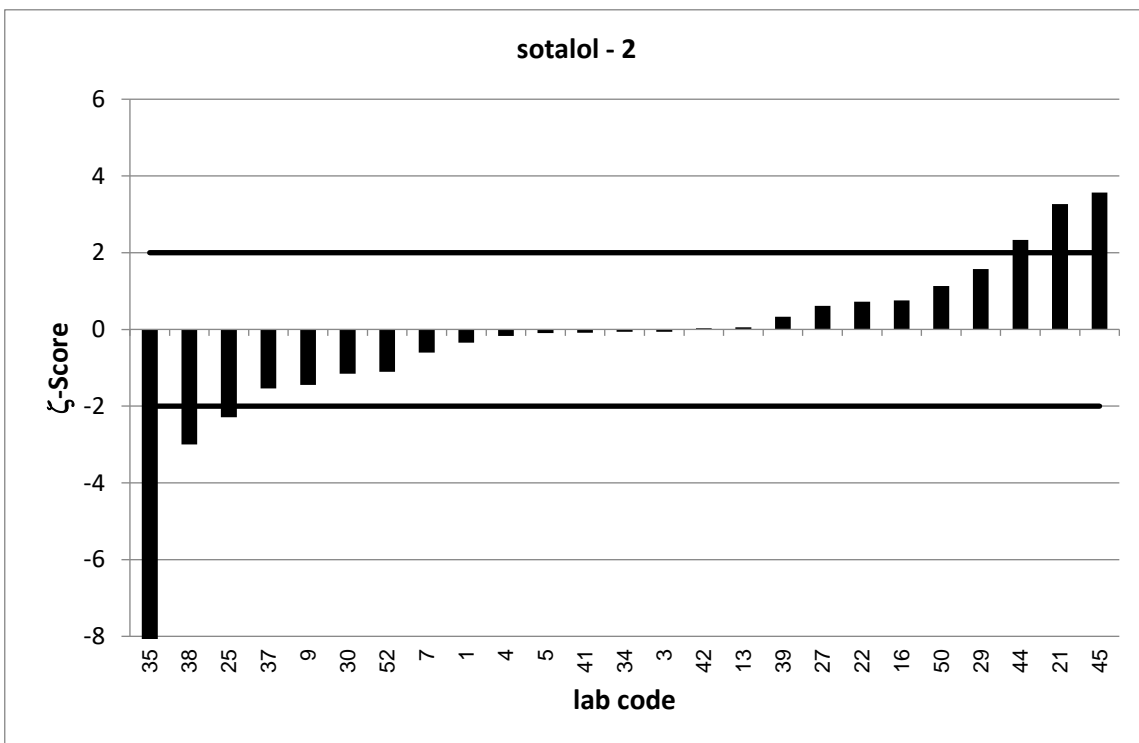
Strongly deviating values are not shown in the diagram.



Strongly deviating values are not correctly shown in the diagram.



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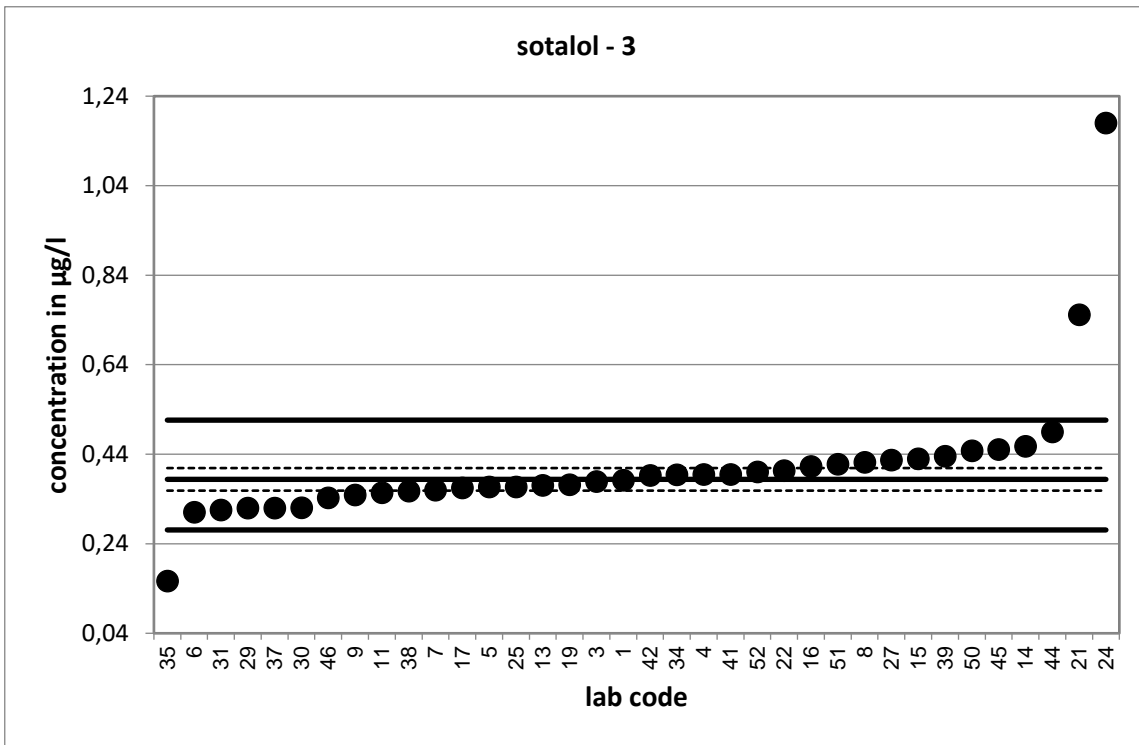


Strongly deviating values are not correctly shown in the diagram.

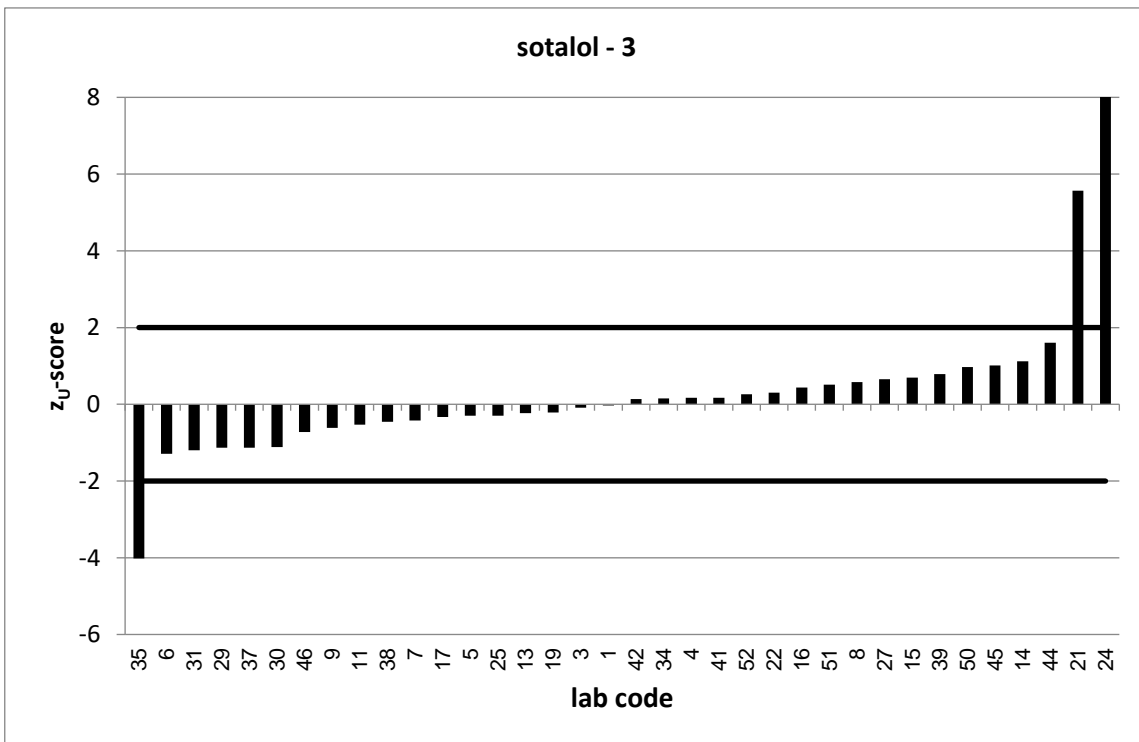
PT 4/23 - TW S2		sotalol - 3			
assigned value [ $\mu\text{g/l}$ ]*		0,3839 $\pm$ 0,0252			
upper tolerance limit [ $\mu\text{g/l}$ ]		0,5162			
lower tolerance limit [ $\mu\text{g/l}$ ]		0,2709			
lab code	result [ $\mu\text{g/l}$ ]	$\pm$	z-score	Z <sub>U</sub> -score	assessm.**
1	0,382	0,076	0,0	0,0	s
3	0,379	0,095	-0,1	-0,1	s
4	0,395	0,138	0,2	0,2	s
5	0,367	0,246	-0,1	-0,3	s
6	0,311			-1,3	s
7	0,36	0,07	-0,6	-0,4	s
8	0,422			0,6	s
9	0,349	0,042	-1,4	-0,6	s
11	0,354			-0,5	s
13	0,371	0,186	-0,1	-0,2	s
14	0,458			1,1	s
15	0,43			0,7	s
16	0,413	0,081	0,7	0,4	s
17	0,365			-0,3	s
19	0,372			-0,2	s
21	0,752	0,226	3,2	5,6	u
22	0,404	0,061	0,6	0,3	s
24	1,18			12,0	u
25	0,367	0,014	-1,2	-0,3	s
27	0,427	0,181	0,5	0,7	s
29	0,32	0,005	-5,0	-1,1	s
30	0,321	0,093	-1,3	-1,1	s
31	0,316			-1,2	s
34	0,394	0,099	0,2	0,2	s
35	0,157	0,013	-16,0	-4,0	u
37	0,32	0,096	-1,3	-1,1	s
38	0,358	0,015	-1,8	-0,5	s
39	0,436	0,149	0,7	0,8	s
41	0,395	0,12	0,2	0,2	s
42	0,393	0,14	0,1	0,1	s
44	0,49	0,1	2,1	1,6	s
45	0,451	0,135	1,0	1,0	s
46	0,343			-0,7	s
50	0,448	0,098	1,3	1,0	s
51	0,418			0,5	s
52	0,401	0,014	1,2	0,3	s

\* The stated uncertainty of the assigned value is the expanded uncertainty with a coverage factor  $k=2$  corresponding to a confidence level of about 95%

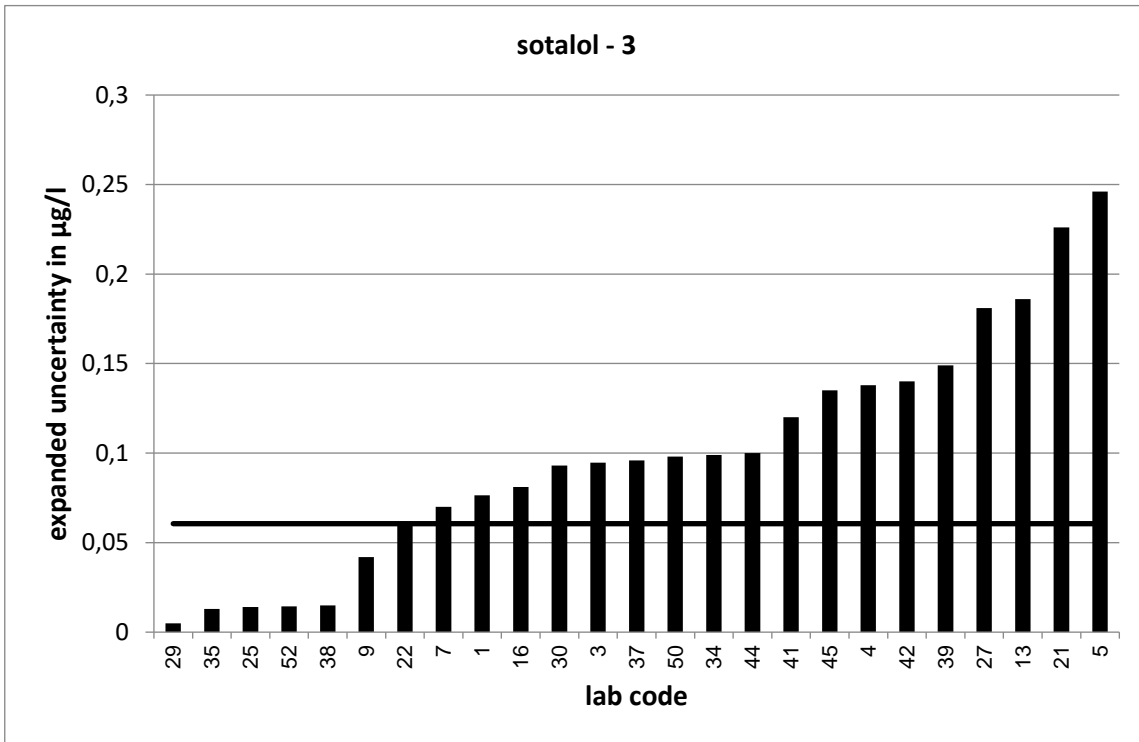
\*\* s = satisfactory, q = questionable, u = unsatisfactory



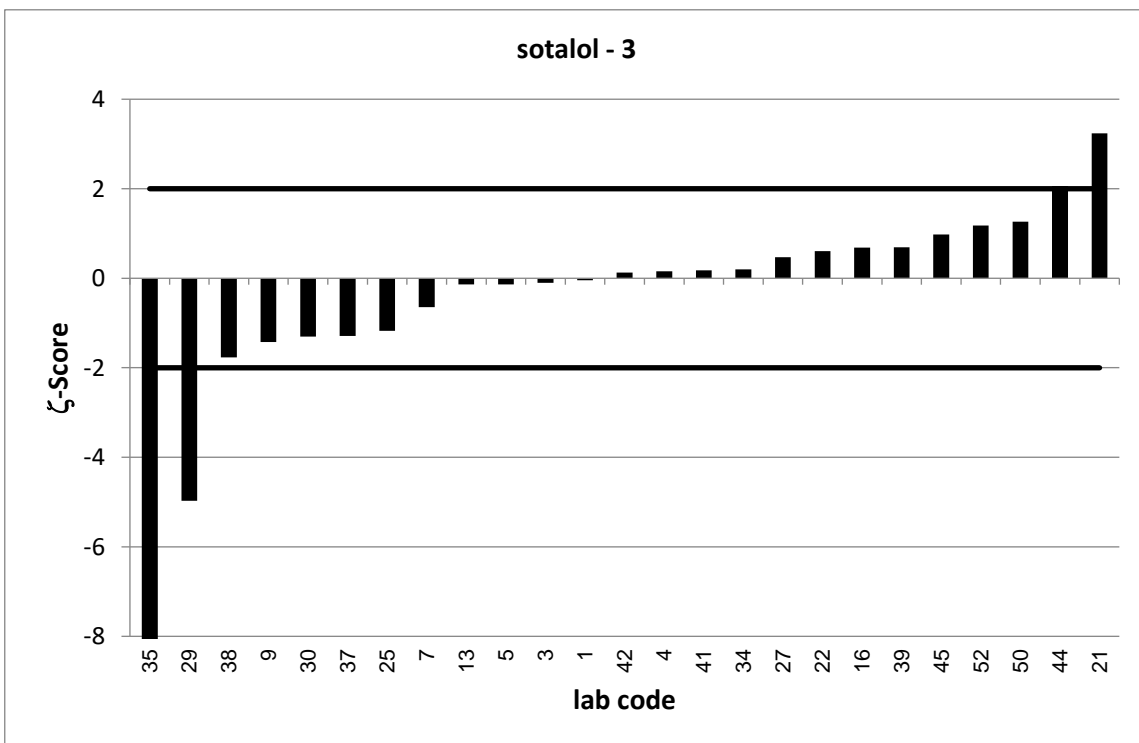
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