



## Introduction

The aim of the Interlaboratory Studies of the European Union Reference Laboratory (EU-RL) Berlin is to promote the residue analysis of anthelmintics,  $\beta$ -agonists, coccidiostats, nitroimidazoles and NSAIDs in different matrices in accordance with articles 32 (1b) and 33 (1c) of CR 882/2004/EC [1]. One of the main applications of Interlaboratory Testing schemes is to assess the ability of the National Reference Laboratories (NRL) of the EU to competently perform the required tests for entire substance groups (especially using multi-methods comprising the greatest possible number of relevant analytes) in order to reach, one day, an EU-wide comparability of results.

## Statistical evaluation

Interlaboratory studies are evaluated according to the prescriptions of DIN EN ISO/IEC 17043:2010 [2], DIN ISO 13528:2005 [3] and DIN 38402-45: 2003-09 [4], using the statistical software package "ProLab Plus 2011" by quo data GmbH, Dresden, Germany [5].

### Statistical parameters (single analyte concentration) [6]:

- Robust estimation of assigned (target) value (HAMPEL)
- Robust estimation of reproducibility SD ( $s_R$ ) – Q-method
- Scoring laboratory results (z score or  $z_U$  score)

### Graphical methods for combining performance scores [7]:

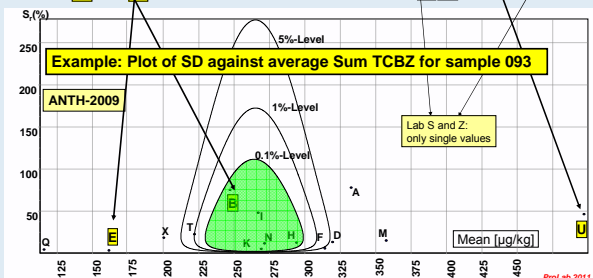
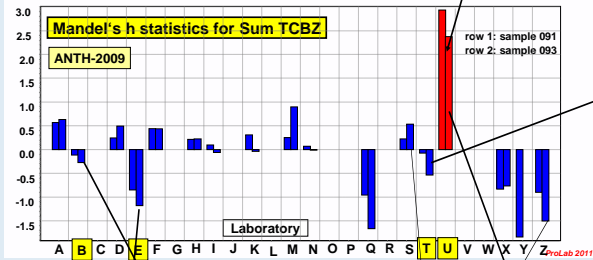
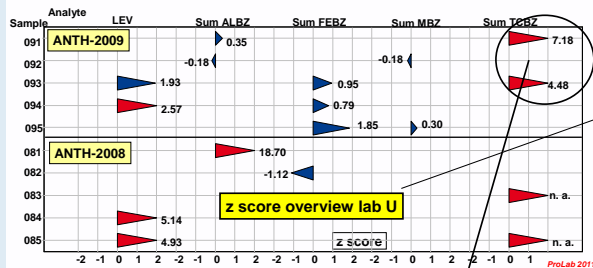
- Z-score overview
- Mandel's-h statistics
- Youden plot
- Combination scores (RSZ and RLP)
- Point – Score – System (see poster Stoyke et al, 2008 [9])

### Graphical methods for monitoring performance over time [8]:

- Shewhart control charts for z-scores

## Samples - Participants - Analytes

PT-Short Name	Species-Matrix Samples	Sample	Analytes	Participants $\Sigma$ (NRL/RFL/TC)
ANTH-2008	Cattle Milk-lyo 6	080	Blank	27 (19/ 2/ 6)
		081	Albendazole (Sum ALBZ)	
		082	Fenbendazole (Sum FEBZ)	
		083	Triclabendazole (Sum TCBZ)	
		084	Levamisole (LEV)	
ANTH-2009	Cattle Muscle-fresh 6	090	Blank	33 (22/ 4/ 7)
		091	Sum ALBZ and Sum TCBZ	
		092	Sum ALBZ and Sum MBZ	
		093	LEV, Sum TCBZ and Sum FEBZ	
		094	LEV and Sum FEBZ	
095	Sum FEBZ and Sum MBZ			

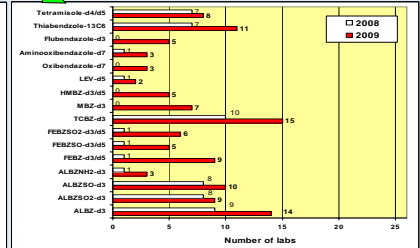
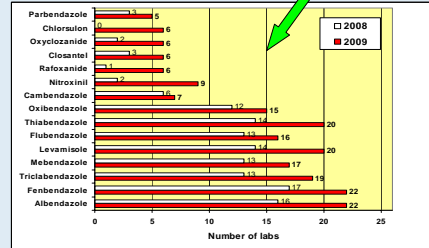


## Results and Discussion

### How to assess the performance of NRLs

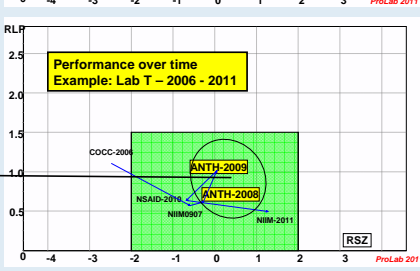
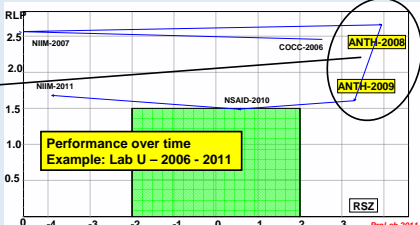
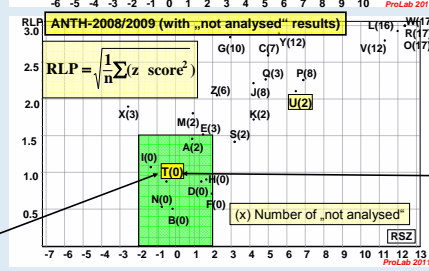
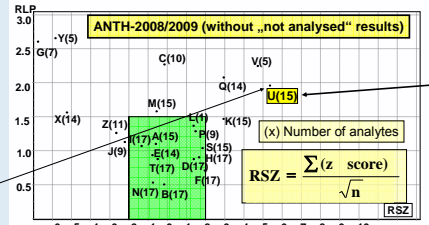
Comparison with the help of the:

Evaluation of used methods								
methods / analytes / false negative and false positive results								
PT-Short Name	Participants	Methods	Analytes (and metabolites)	Isotopic IS	False positive results	False negative results	Point score system	Labs successful (out of 26)
ANTH-2008	19 out of 26 (73.1%)	15x LC-MSMS 1x GC-MS and LC-DAD 2x LC-DAD 1x LC-FLU	15.3	3.5	8	3.2% not found (n.f.) 44.2% not analysed (n.a.)	45.6% of max. points	10 (38.5%)
ANTH-2009	22 out of 26 (84.6%)	19x LC-MSMS 1x LC-TOF 1x GC-MS and UPLC-DAD 1x LC-DAD	19.2	5.7	3	2.8% not found (n.f.) 7.0% not analysed (n.a.)	57.0% of max. points	14 (53.8%)



### How to assess the overall performance of the laboratories?

Evaluation of test results							
assigned value / target standard deviation / HORWITZ ratio (Horrat)							
PT-Short Name	Sample	Number of labs	Number measurements	Analytes	Assigned value (µg/kg)	Reproducibility SD $s_R$ (%)	Horwitz ratio
ANTH-2008	081	17	40	Sum ALBZ	226.6	25.0	1.25
	082	16	34	Sum FEBZ	13.3	33.7	1.10
	083 / 085	11 / 11	24 / 24	Sum TCBZ	36.3 / 45.8	41.6 / 25.6	1.58 / 1.01
	084 / 085	14 / 13	30 / 26	LEV	6.3 / 7.2	35.5 / 20.8	1.01 / 0.62
ANTH-2009	091 / 092	21 / 21	48 / 46	Sum ALBZ	145.7 / 204.5	37.0 / 42.4	1.73 / 2.09
	093 / 094 / 095	22 / 22 / 21	50 / 50 / 47	Sum FEBZ	53.3 / 146.8 / 97.6	32.1 / 30.8 / 25.3	1.29 / 1.44 / 1.12
	091 / 093	17 / 16	36 / 34	Sum TCBZ	240.7 / 265.0	24.1 / 37.2	1.22 / 1.90
	092 / 095	18 / 18	41 / 41	Sum MBZ	93.6 / 81.7	40.1 / 45.4	1.75 / 1.95
	093 / 094	17 / 18	41 / 42	LEV	4.3 / 12.2	27.4 / 30.3	0.75 / 0.98



## Conclusions

- The described methods of evaluation show how an overall assessment of the performance levels of laboratories and of the employed methods can be realised.
- The combination scores used allow an evaluation of all analyte/ matrix combinations of a PT or even of several PTs.
- The combination scores used allow the inclusion of false negative results (n.a./ n.f.) in the evaluation
- The overall evaluation should be done on a uniform statistical basis for all PTs.

## References

- [1] Council Regulation 882/2004/EC
- [2] ISO/IEC 17043:2010 "Conformity assessment – General requirements for proficiency testing"
- [3] ISO 13528:2005 – "Statistical methods for use in Proficiency Testing by interlaboratory comparisons"
- [4] DIN 38402-45:2003-09 "German standardised procedures for the analysis of water, sewage and sludge; general information – part 45"
- [5] Handbook ProLab Plus Version: 2.14 – "ProLab Plus Manual", quo data GmbH, Dresden (2011) – [www.quodata.de](http://www.quodata.de)
- [6] see robust methods according to DIN 38402-45 (ISO/TS 20612) in accordance to ISO 17043 and ISO 13528
- [7] see ISO 17043: B.3.3 and ISO 13528: point 8
- [8] see ISO 17043: B.4.2 and ISO 13528: point 9
- [9] Stoyke, M.; W. Radeck and P. Gowik (2008), Poster, 6th Workshop Proficiency Testing in Anal. Chemistry, Microbiol. and Lab. Medicine; Rom, Italy, 3–6 October

**Acknowledgement:** The financial support of the European Commission is gratefully acknowledged. The Federal Institute for Risk Assessment (BfR) is gratefully acknowledged for providing the opportunity to use its animal holding and slaughtering facilities. The quo data GmbH Dresden is gratefully acknowledged for providing the latest software versions and helpful discussions.