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## Introduction

For more than ten years, the European Union Reference Laboratory (EURL) for Pharmacologically Active Substances in Berlin has organised proficiency tests (PT) to assess the ability of National Reference Laboratories (NRL) as well as of official control laboratories from Third Countries (TC) to analyse  $\beta$ -agonists, coccidiostats, nitroimidazoles, anthelmintics and NSAIDs.

PT (2002-14)	RM – Species-Matrix	Participants	Group
NSAID_05/02	Cattle-Plasma-Iyo (3)	29	NSAIDs
COCC_06/03	Poultry-Egg-Iyo (4)	23	Coccidiostats
BETA_06/04	Cattle-Urine-fresh (4) Cattle-Liver-Iyo (4)	36	$\beta$ -Agonists
AVER_07/05	Cattle-Milk-Iyo (6)	34	Avermectins
COCC_06/06	Poultry-Egg-Iyo (7)	34	Coccidiostats
NIIM_09/07	Poultry-Egg-Iyo (5)	43	Nitroimidazoles
ANTH_04/08	Cattle-Milk-Iyo (6)	27	Anthelmintics
ANTH_09/09	Cattle-Muscle-Iyo (6)	36	Anthelmintics
NSAID_09/10	Cattle-Milk-Iyo (6)	46	NSAIDs
NIIM_05/11	Pig-Plasma-Iyo (3)	50	Nitroimidazoles
BETA_10/12	Cattle-Hair-grounded (5)	33	$\beta$ -Agonists
COCC_10/13	Poultry-Muscle-Liver-Egg-fresh (8)	47	Coccidiostats
ANTH_10/14	Cattle-Milk-fresh (6)	Registration open until 10th October	Anthelmintics

## Sample preparation

The samples contained incurred residues of veterinary drugs. Moreover, one or two blank sample were included in the PT. All veterinary drugs were administered via the feed, drinking water, or in the way they would usually be applied as veterinary medicine. The incurred samples were homogeneity-tested in accordance with ISO 13528:2005.

The stability tests included all analyte/matrix combinations. The short-term stability was tested for periods of one day up to 28 days at the usual temperatures.

## Statistical methods

### Calculation of performance statistics

- Robust estimation of assigned (target) value (HAMPEL)
- Robust estimation of reproducibility SD ( $s_R$ ) – Q-method
- Horwitz ratio (HorRat) and scoring of laboratory results (Z-score)

### Graphical methods for combining performance scores (for several analytes from one round or over several rounds of a proficiency testing scheme)

- Z-score overview and Mandel's-h statistics
- Rescaled Sum of Z-Scores (RSZ) and Relative Lab Performance (RLP)

$$RSZ = \frac{\sum (z\text{-score})}{\sqrt{n}}$$

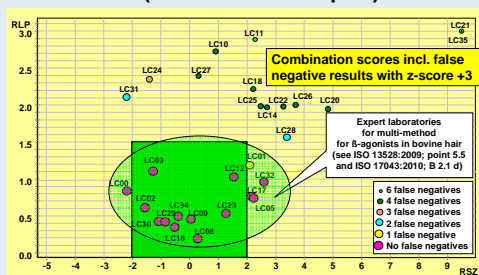
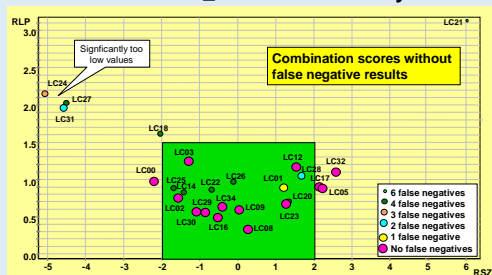
$$RLP = \sqrt{\frac{1}{n} \sum (z\text{-score}^2)}$$

### Graphical methods for monitoring performance over time

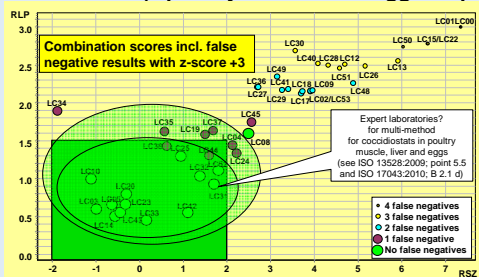
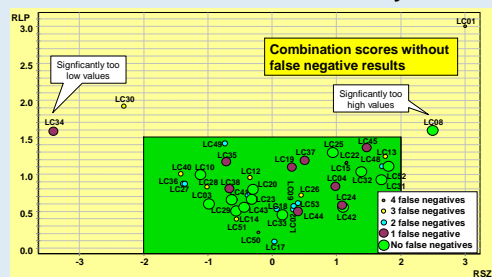
- Control charts for combination scores

## Results and Discussion

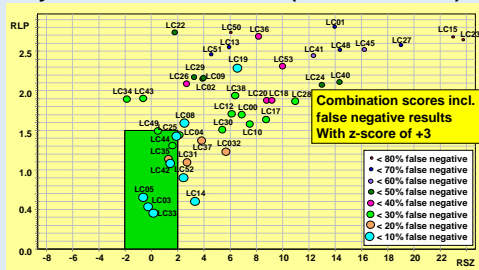
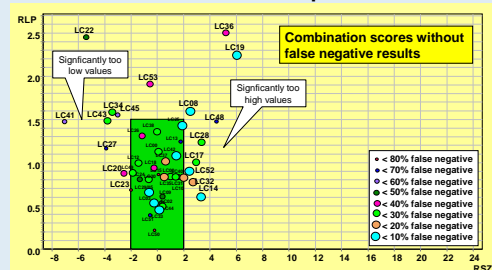
### • Results of PT BETA\_10/12 with 10 analyte/matrix combinations (5 bovine hair samples)



### • Results of PT COCC\_10/13 with 6 analyte/matrix combinations (8 poultry muscle/liver/egg samples)



### • Results of all PTs from 2002 up to 2013 with 114 analyte/matrix combinations (see table above)



## Conclusions

The presentation shows that the used statistical methods are effective tools for interpreting the performance of laboratories with regard to multi-analyte methods and the performance over several rounds of PTs according to ISO 13528 and ISO 17043. Laboratories with insufficient multi-analyte methods or systematic and random deviations of their analytical results can be easily identified by means of the described statistical procedures.

## Acknowledgement

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## Results and Discussion

### • Results of all PTs from 2002 to 2013 with 114 analyte/matrix combinations for one laboratory

(see ISO 13528:2009; point 9 – „Graphical methods for combining performance scores over several rounds of a proficiency testing scheme“ and ISO 17043:2010; B 4.2.1 – „Monitoring performance over time“)

