Proficiency Testing

Inter-laboratory comparisons are widely used for a number of purposes

ISO 17043:2010

Tim Herrman
Professor, State Chemist and Director
Office of the Texas State Chemist

TEXAS A&M AGRILIFE RESEARCH

Proficiency Testing

One of the big 3 – along with uncertainty and traceability

Purposes of Proficiency Testing

a) Evaluation of the performance of laboratories for specific tests or measurements and monitoring laboratories' continuing performance

b) Identification of problems in laboratories and initiation of actions for improvement which may be related to inadequate test or measurement procedures, effectiveness of staff training and supervision or calibration of equipment

c) Establishment of the effectiveness and comparability of test and measurement methods

ISO 17043:2010

Purposes of Proficiency Testing (cont'd)

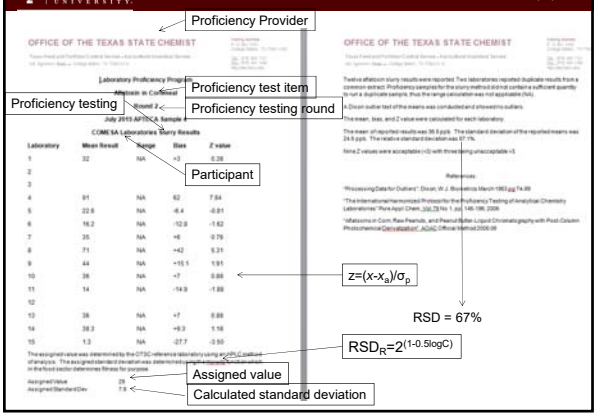
d) Provision of additional confidence to laboratory customers

e) Identification of inter-laboratory differences

f) Education of participating laboratories based on the outcomes of such comparisons

g) Validation of uncertainty claims

ISO 17043:2010



Harmonized Protocol for Proficiency Testing

"It is important to emphasize that the interpretation of z-scores in not generally based on summary statistics that describe the observed participant results." (3.1.2 p 157)

A score of zero implies a perfect result.

Approximately 95% of z-scores fall between -2 and +2.

A score outside the range from -3 to 3 should be investigated.

A score in the ranges -2 to -3 and 2 to 3 would be expected about 1 in 20.

Harmonized Protocol for Proficiency Testing

Assigned Value

- An assigned value and uncertainty may be obtained by a suitably qualified measurement laboratory using a method with sufficiently small uncertainty
- Certified reference material

Consensus – Disadvantages

- Not independent of participant results
  - Bias for the population may not be detected
  - Participants whose results are unbiased may unfairly receive extreme z-scores
- Their uncertainty may be too large when the number of labs is small

Assigned Mean – OTSC AAS

APTECA Proficiency #4 (N2013-001095)

	B1	B2	G1	G2	Total
	24.3	2.0	0.0	0.0	26
	26.1	2.3	0.0	0.0	28
	28.8	2.4	0.0	0.0	31
	24.9	2.2	0.0	0.0	27
	24.5	2.7	0.0	0.0	27
	23.8	2.4	4.0	0.0	30
	26.7	2.8	0.0	0.0	30
	27.3	2.7	4.2	0.0	34
	33.9	2.9	0.0	0.0	37
	27.3	2.7	0.0	0.0	30
	22.3	2.3	0.0	0.0	25
	21.8	2.2	0.0	0.0	24
Average	26.0	2.5	0.7	0.0	29
SD	3.3	0.3	1.6	0.0	3.8
RSD (%)	12.6	12.0	233.6		12.9

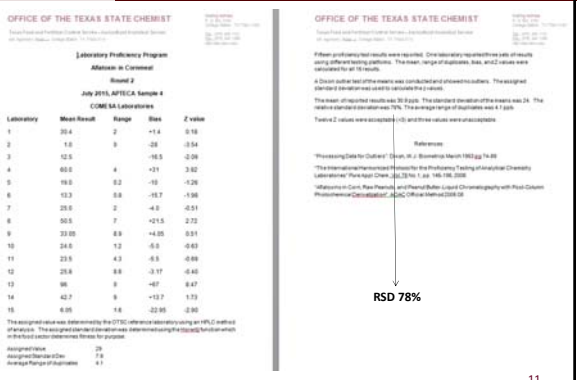
Horwitz Function to Calculation Standard Deviation

aflatoxin (ppb)	Mass fraction	Log	Expected RSD (%)	Standard Deviation
10	0.00000001	-8.0	32.0	3.2
29	0.000000029	-7.5	27.3	7.9
100	0.0000001	-7.0	22.6	22.6
300	0.0000003	-6.5	19.2	57.5

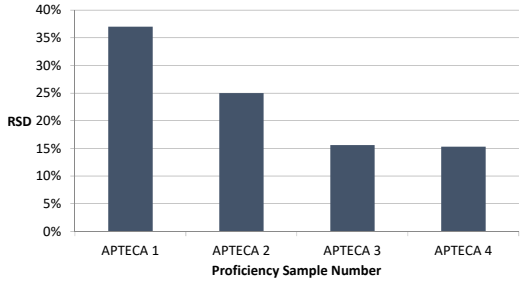
The Horwitz function is often regarded as defining fitness-for-purpose in the food sector Harmonized Protocol for proficiency testing p 163

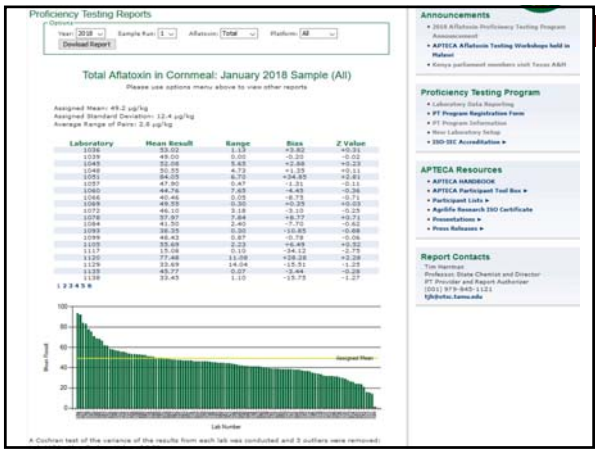
Reference laboratory standard deviation = 3.8

COMESA laboratories' consensus standard deviation = 24.0



Kenya Milling Industry Performance





TEXAS A&M UNIVERSITY | Lab Quality Systems

Summary

- Proficiency testing for aflatoxin testing in Kenya improved accuracy of laboratories
- Assigned mean and standard deviation is used by the Texas A&M Aflatoxin Proficiency Testing and Control in Africa, Asia, Americas and Europe (APTECA) program
- The ISO 17043 standard for proficiency testing provides a common format and requirements for this program along with the International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories
- Preparation of proficiency testing material should follow the same protocol for developing reference material

14

TEXAS A&M UNIVERSITY | Lab Quality Systems

Contact Information:
tjh@otsc.tamu.edu

Tim Herrman
Professor, State Chemist and Director
Office of the Texas State Chemist

TEXAS A&M AGRILIFE RESEARCH