9th Microbiology PT Evaluation Workshop within the SADCMET Proficiency Testing Scheme for Water Testing Laboratories

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1 Introduction

This report summarizes the topics and discussions of the evaluation workshop for the 9th microbiological PT round provided by Botswana Bureau of Standards (BOBS). The workshop was hosted by Malawi Bureau of Standards and held in conjunction with the evaluation workshop for the Chemistry PT provided by Namwater, Namibia.

A PMC meeting and general assembly of the SADC WaterLab Association was also conducted during the workshop.

Botswana Bureau of Standards provided this proficiency-testing scheme for microbiological parameters in drinking water for the third time. Although preparation of the material at BOBS was envisioned there are still challenges to be overcome. Therefore material from the National Food Agency (Sweden) was used. This is known to be mostly stable even if transported under ambient temperatures.

Workshop presentations will be made available at http://www.SADCMET.org.

2 Participants

The evaluation workshop of the 9th microbiology proficiency testing round was attended by 29 participants representing laboratories from 14 different countries. Showing the great interest in the evaluation workshop that gives an opportunity for networking and discussion with other laboratories.

Botswana	6	Kenya	1	Seychelles	1	Zambia	2
Burundi	1	Malawi	7	South Africa	1	Zimbabwe	1
DR Congo	2	Madagascar	1	Swaziland	1		
Ethiopia	1	Namibia	1	Tanzania	2		

3 Workshop - summary

The evaluation workshop of the 2017 Microbiology PT for water testing laboratories was hosted by Malawi Bureau of Standards, Lilongwe, and held in conjunction with the evaluation workshop for the chemistry PT provided by Namwater, Namibia. All participants were welcomed by Mr. Fred Sikwese (MBS) to the workshop venue and greetings were extended by the SADCWaterLab Association chair Mr. David Koech (KEBS), and the SADCMET Regional Coordinator Mr. Donald Masuku. All emphasized the importance of building up infrastructure for water testing laboratories in the region.

During the three days of the workshop the main topic for the microbiology group was an in depth evaluation of the 2017 PT round starting with a report of the PT provider Botswana Bureau of Standards (BOBS) represented by Mr. Itseng Saudu. This was followed by the detailed evaluation of the PT results by Dr. K. Luden. Feedback on the PT was discussed during a session on the way forward concluding that part of the workshop.

On day two of the workshop training was conducted on method validation with an introduction to the new ISO 13843: Water quality - Requirements for establishing performance characteristics of quantitative microbiological methods.

The workshop concluded with the general assembly of the SADC WaterLab Association and a visit to the Chemistry section of Malawi Bureau of standards water.

4 Report of the PT provider

Mr. Itseng Saudu (BOBS) reported on the technical details of the PT as well as the evaluation (see Annex 1). As previously freeze-dried material procured from NFA (Sweden) was used for the 2016 PT round. This material contained low concentrations of bacteria so the handling steps were limited. The PT material was shipped in padded envelopes without temperature control as it was considered very stable.

The number of participating laboratories again was high (n=72) and a robust statistical method for calculation of the assigned value from participants results. There was a fair interest in the scheme. Most samples arrived at their destinations within a few days. From the details reported with the results it was difficult to extract what was done as the information was not always conclusive. Still there were a lot of different methods were used for analysis of the samples and not all of them seemed suitable. Quite a few laboratories did not use the recommended methods for drinking water analysis or did not report proper information on the methods.

5 Evaluation of the PT

PT results and interpretation were discussed with emphasis on statistical methods used (see Annex 2 for presentation).

Assigned values

For each parameter the assigned value and the attached standard deviation for the assessment of this PT was calculated using robust statistics (Algorithm A) as described in ISO 13528.

Standard deviation/z-scores

One problem with the PT assessment remains: due to a high variability of the participants results the standard deviation for calculation of z-scores still is unacceptable high. Using this for evaluation of the performance would lead to a very large range of acceptable or questionable test results. In consequence a lot of values would not be recognized as questionable.

One of the major conclusions from previous workshop was that the evaluation should be based on a limited standard deviation based on experience of the PT provider and the manufacturer of the material. Therefore the results were evaluated using a predetermined or limited standard deviation for calculation of z-scores. The acceptable

standard deviation was set to 15 % and 20% (P. aeruginosa only) respectively. The details are given in the Report of the PT and in the presentation Annex 2.

Table 1: Summary of assigned values using Algorithm A

Consensus values of participants results (limited standard deviation)	Vol	Assigned value	Lower action limit	Lower warning limit	Upper warning limit	Upper action limit
	ml	CFU	CFU	CFU	CFU	CFU
Total Coliform Bacteria	10	29	9	14	50	62
E. coli	10	17	5	8	28	35
Coliform bacteria (44°C)	10	13	4	6	22	27
Intestinal enterococci	10	38	11	18	64	79
Pseudomonas aeruginosa[a]	10	16	2	6	31	40
C. perfringens	10	0	-	-	-	-
Total Plate Counts (36°C)	1	18	6	9	31	39
Total Plate Counts (22°C)	1	17	5	8	28	35

[a] standard deviation for evaluation of the PT σ = 20% (for all other parameters 15%)

E. coli / Coliform bacteria

- very high variation of test results probably due to inappropriate methods
- If confirmation of presumptive Coliform bacteria using ISO 9308-1:2001 (Lactose TTC) relies only on Indole production *K. oxytoca* might be mistaken for E. coli. A ß-glucuronidase test is necessary to prevent false positive results for this method. The Lactose TTC method has been replaced with the CCA method with the publication of the ISO 9308-1:2014 and should not be used any more.
- Very inconclusive information has been given on the standard, medium, times and temperatures as well as confirmation steps indicating that the standards might not be followed strictly. Any deviation from the standard might negatively influence the outcome of the examination.
- Plate count methods cited are not suitable methods for a parameter (E. coli) with a legal requirement of 0/100 ml.

Enterococci

- A lot of laboratories used ISO 7899-1 as a method and that seems to be quite appropriate. Nevertheless quite a few laboratories did not detect any Enterococci in the sample. Especially the Slanetz and Bartley agar might give low recoveries with some membranes. To control the quality of the membrane-agar combination it could be checked against a nonselective agar for productivity.

Pseudomonas aeruginosa

- Again the results for this parameter showed the highest variation of all parameters in the PT.

C. perfringens

- The material used did not contain C. perfringens. Nevertheless almost half the participating laboratories reported false positive results. These laboratories need to check their methods especially the confirmation procedure might need improvement.

Culturable microorganisms at 22°C and 36°C

- Some results reported were unreasonably high pointing to either dilution problems or contamination or misinterpretation during reading the plates.

Conclusions

Due to the high variability of the reported results it was necessary to limit the standard deviation for calculation of z-scores. With this type of evaluation it can be concluded that there is a still a great need for improvement in the laboratory procedures. Not everything can be attributed to the nature of the material and the handling steps the laboratory staff might not be used to.

Especially a high number of laboratories reporting false positive results for *C. perfringens* showed that there is considerable need for corrective action concerning the methods and/or the confirmation steps.

Unfortunately the overall outcome of the PT in terms of laboratory performances has not changed much for the better. Importance and value of PT schemes seem to be recognized but difficulties appear to exist in following up with root cause analysis and corrective actions. So in general the PT scheme constitutes an important part of quality control measures for laboratories. The outcome still points in the direction of need for improvement.

6 Training on “method validation” (ISO 13843)

The training focused on the approach of how to characterize and check the performance of a chosen quantitative microbiological method according to the new ISO 13843:2017. It is essential for any laboratory that it is able to perform a method fit for its purpose. Only this way the customer can rely on the outcome of the examination and base business decisions on it. Therefore establishing performance characteristics and deciding whether the performance is fit for purpose, and comparable and compatible with customers needs is crucial for any laboratory Annex 3.

7 Feedback - Way forward

Mr. Itseng Saudu (BOBS) posed questions and collected feedback from the group to further improve the PT scheme. It was discussed and emphasized that the communication between PT provider and participating laboratories can be improved. This is especially true for the financial matters (payment of fees and sending prove of pament).

8 SADCWaterLab Association general assembly

On the last day oft he workshop a SADCWaterLab Association general assembly was held. The minutes will be made available by the secretariat.

9 Evaluation of the workshop by participants

An evaluation questionnaire was distributed on the last day of the workshop. In general the two workshops (microbiology and chemistry) fulfilled the participants` expectations. It was notable that especially the networking opportunity is very much appreciated as was in the previous workshops. Apart from detailed evaluation of each years PT there is always room for discussions and sharing experiences with other laboratories. This helps to develop tailor-made solutions for the challenges each laboratory faces.

A summary of questions and detailed answers and suggestions are given in Annex 4.

Annex 1 – Report of the PT provider

Annex 2 – Evaluation of the PT

Annex 3 – Training ISO 13843:2017 Water quality - Requirements for establishing performance characteristics of quantitative microbiological methods

Annex 4 – Evaluation of the workshop / Feedback