Fapas® – Water and Environmental Report DWM086

Drinking Water Microbiology

August- September 2024

PARTICIPANT LABORATORY NUMBER

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Laboratory numbers are displayed in SecureWeb next to the download link for this report.

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SUMMARY

1. The test materials for Fapas® – Drinking Water Microbiology proficiency test Distribution DWM086 were dispatched in August 2024. The test materials available in this Distribution were for the following proficiency tests:

Test Material A	DW086m01 Enumeration of total coliforms,
Test Material A	DW086m01 Enumeration of *Escherichia coli,*
Test Material B	DW086m02 Colony count after 3 days at 22°C,
Test Material B	DW086m02 Colony count after 2 days at 37°C,
Test Material C	DW086m03 Enumeration of enterococci,
Test Material C	DW086m03 Enumeration of *Pseudomonas aeruginosa,*
Test Material C	DW086m03 Enumeration of *Clostridium perfringens.*

2. An assigned value (x_a) was determined for each proficiency test in enumeration and in conjunction with the standard deviation for proficiency (σ_p) was used to calculate a z-score for each result.

3. Results for this proficiency test are summarised as follows:

Test Material A

organism	assigned value, x_a SQRT cfu/100ml	number of scores, |z| ≤2	total number of scores	% |z|≤2
Total Coliforms	4.59	28	30	93
Escherichia coli	3.81	28	30	93

SQRT - square root

Test Material B

organism	assigned value, x_a SQRT cfu/ml	number of scores, |z| ≤2	total number of scores	% |z| ≤2
Colony Counts (22°C/3 days)	9.11	7	9	78
Colony Counts (37°C/2 days)	10.5	12	13	92

SQRT - square root

Test Material C

organism	assigned value, x_a SQRT cfu/100ml	number of scores, $\|z\| \leq 2$	total number of scores	% $\|z\| \leq 2$
Enterococci	5.17	12	12	100
Pseudomonas aeruginosa	4.64	13	14	93
Clostridium perfringens	4.78	4	4	100

SQRT - square root

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1. INTRODUCTION

1.1. Proficiency Testing

Proficiency testing aims to provide an independent assessment of the competence of participating laboratories. Together with the use of validated methods, proficiency testing is an essential element of laboratory quality assurance.

Further details of the Fapas® – Water and Environmental proficiency tests are available in our protocols [7, 8].

2. TEST MATERIAL

2.1. Preparation

Preparation of the samples for this proficiency test was sub-contracted to a laboratory meeting the quality requirements of the scheme's accreditation [3].

Each test material comprised of a small glass vial containing an inoculum pellet, sealed with a rubber bung and crimp-capped. The organisms present in the inoculum pellets were as follows:

Test Material A	*Escherichia coli* and *Klebsiella planticola,*
Test Material B	*Enterococcus faecalis* and *Staphylococcus epidermidis,*
Test Material C	*Enterococcus faecalis*, *Pseudomonas aeruginosa* and *Clostridium perfringens*.

The test materials were stored at +4°C ±2°C until dispatch.

2.2. Homogeneity

To test for homogeneity, randomly selected test materials were analysed in duplicate by a laboratory meeting the quality requirements of the scheme's accreditation [3].

These data showed sufficient homogeneity and were not included in the subsequent calculation of the assigned values.

2.3. Dispatch

The start date was 14 August 2024. Test materials were sent to 47 participants.

3. RESULTS

The instructions for reporting results were as follows:

- Start the analysis as soon as possible. Keep the small glass vial(s) at +4°C ±2°C until analysis.
- For proficiency tests DW086m01 (Test Material A), DW086m03 (Test Material C): Results for Total Coliforms, *Escherichia coli*, Enterococci, *Clostridium perfringens* and *Pseudomonas aeruginosa* must be reported in cfu/100ml.
- For proficiency test DW086m02 (Test Material B): Results for colony counts must be reported in cfu/ml.

Results were submitted by 44 participants (94%) before the closing date for this test, 04 September 2024.

Each participant was given a laboratory number, assigned in order of receipt of results. The reported results are given in Tables 1 to 5.

Participants' comments are given in Table 6.

The methods used by each participant are summarised in APPENDIX I.

4. STATISTICAL EVALUATION OF RESULTS

The results submitted by participants were statistically analysed in order to provide an assigned value for each proficiency test in enumeration. The assigned values were then used in combination with the standard deviation for proficiency, σ_p, to calculate a z-score [9] for each result. The procedure is detailed in the relevant protocols [7, 8].

Further background on the procedure followed can be found in the IUPAC International Harmonised Protocol for the Proficiency Testing of Analytical Chemistry Laboratories [10].

4.1. Calculation of the Assigned Value, x_a

The assigned value, x_a, for each test in enumeration was derived from the consensus of the results submitted by participants.

The procedure used to derive this consensus involved:

i) exclusion, if present, of any non numerical results i.e. qualitative or semi-quantitative results,

ii) a square root transformation of submitted results to obtain a normal distribution,

iii) exclusion, if present, of any results that were approximately 10, 100 or 1000 × greater or smaller than the majority of submitted results (as these were considered to be reporting errors).

For the total coliforms and *E. coli* enumerations, this procedure was straightforward and the robust mean was chosen as the assigned value.

For the colony count after 3 days at 22°C, colony count after 2 days at 37°C, enterococci, *P. aeruginosa* and *C. perfringens* enumerations, the median was chosen as the assigned value as this was considered the best measure of consensus due to the low number of data points.

The assigned values for all proficiency tests in enumeration, together with their uncertainties are shown in Table 7.

4.2. Standard Deviation for Proficiency, σ_p

A fixed standard deviation has been set at a value that reflects fitness-for-purpose for the analyses in question and the appropriate members of the Fapas® Advisory Committee have agreed these values.

The values for σ_p used to calculate z-scores from the reported results of this test are given in Table 7.

4.3. Individual z-Scores

Participants' z-scores were calculated as:

$$z = \frac{(x - x_a)}{\sigma_p}$$

where x = the square root of the participant's reported result,
x_a = the assigned value, see Table 7,
and σ_p = the standard deviation for proficiency, see Table 7.

Participants' z-scores for all proficiency tests in enumeration are given in Tables 1 to 5 and shown as histograms in Figures 1 to 7. It is possible for the z-scores published in this report to differ slightly from the z-score that can be calculated using the formula given above. These differences arise from the necessary rounding of the actual assigned values and standard deviations for proficiency prior to their publication in Table 7.

The number and percentage of z-scores in the range $-2 \leq z \leq 2$ for all proficiency tests in enumeration are given in Table 8.

5. INTERPRETATION OF SCORES

In normal circumstances, over time, about 95% of z-scores will lie in the range $-2 \leq z \leq 2$. Occasional scores in the range $2 < |z| < 3$ are to be expected, at a rate of 1 in 20. Whether or not such scores are of importance can only be decided by considering them in the context of the other scores obtained by that laboratory.

Scores where $|z| > 3$ are to be expected at a rate of about 1 in 300. Given this rarity, such z-scores very strongly indicate that the result is not fit-for-purpose and almost certainly requires investigation.

The consideration of a set or sequence of z-scores over time provides more useful information than a single z-score. Examples of suitable methods of comparison are provided in the IUPAC International Harmonised Protocol for the Proficiency Testing of Analytical Chemistry Laboratories [10].

6. REFERENCES

1 Adobe Approved Trust List, https://helpx.adobe.com/acrobat/kb/approved-trust-list2.html#Whatisit accessed 23/02/2024.

2 GlobalSign AATL Document Signing FAQs, https://support.globalsign.com/aatl-document/aatl-document-signing-faqs accessed 23/02/2024.

3 ISO/IEC 17043:2010, Conformity assessment – General requirements for proficiency testing.

4 The ILAC Mutual Recognition Arrangement, https://ilac.org/ilac-mra-and-signatories/ accessed 23/02/2024.

5 Fera Science Ltd, Standards & Accreditations, https://www.fera.co.uk/about-us/standards-and-accreditation accessed 23/02/2024.

6 Lloyd's Register, Learn about ISO 9001 Quality Management Systems (QMS), https://www.lrqa.com/en-gb/iso-9001/?epslanguage=en-GB#accordion-whatarethebenefitsofiso9001certification accessed 23/02/2024.

7 Fapas®, 2023, Protocol for Proficiency Testing Schemes, Version 8, January 2023, Part 1 – Common Principles.

8 Fapas®, 2023, Protocol for Proficiency Testing Schemes, Version 8, January 2023, Part 5 – Fapas® Water and Environmental scheme (LEAP).

9 AMC Tech Brief No. 74, z-Scores and other scores in chemical proficiency testing – their meanings, and some common misconceptions, *Anal. Methods*, 2016, **8**, 5553.

10 Thompson, M., Ellison, S.L.R. and Wood, R., 2006, The International Harmonised Protocol for the Proficiency Testing of Analytical Chemistry Laboratories, *Pure Appl. Chem.*, **78**, No. 1, 145–196.

Table 1: Results and z-Scores for Enumeration of Total Coliforms and *Escherichia coli*

laboratory number	organism							
	Total Coliforms assigned value: 4.59 SQRT cfu/100ml				*Escherichia coli* assigned value: 3.81 SQRT cfu/100ml			
	result cfu/100ml	SQRT cfu/100ml	method	z-score	result cfu/100ml	SQRT cfu/100ml	method	z-score
001	19	4.36	membrane filtration	-0.2	14	3.74	membrane filtration	0.0
002	23	4.80	MEMBRANE FILTRATION	0.1	16	4.00	MEMBRANE FILTRATION	0.1
004	26	5.10	Membrane filtration	0.3	19	4.36	membrane filtration	0.4
005	14	3.74	MPN	-0.6	11	3.32	MPN	-0.3
006	21	4.58	MEMBRANE FILTRATION	0.0	13	3.61	MEMBRANE FILTRATION	-0.1
007	6.7	2.59	MPN	-1.3	5.9	2.43	MPN	-0.9
009	14	3.74	membrane filtration	-0.6	5	2.24	membrane filtration	-1.1
010	Not detected		compact dry		Not detected		compact dry	
012	17	4.12	MPN	-0.3	16.5	4.06	MPN	0.2
015	33	5.74	Membrane filtration	0.8	20	4.47	Membrane filtration	0.4
016	28	5.29	MPN	0.5	22	4.69	MPN	0.6

z-scores outside |z| >2 are shown in **bold,** see Section 5
SQRT - square root

Table 1 (continued): Results and z-Scores for Enumeration of Total Coliforms and *Escherichia coli*

laboratory number	organism							
	Total Coliforms assigned value: 4.59 SQRT cfu/100ml				*Escherichia coli* assigned value: 3.81 SQRT cfu/100ml			
	result cfu/100ml	SQRT cfu/100ml	method	z-score	result cfu/100ml	SQRT cfu/100ml	method	z-score
017	50	7.07	membrane filtration	1.7				
018	14	3.74	IDEXX Colilert-18/Quantiray	-0.6	11	3.32	IDEXX Colilert-18/Quantiray	-0.3
019					19	4.36	Membrane filtration	0.4
021	12	3.46	membrane filtration	-0.8	5	2.24	membrane filtration	-1.1
022	23.8	4.88	MPN	0.2	15	3.87	MPN	0.0
023	14	3.74	Membrane filtration	-0.6	10	3.16	Membrane filtration	-0.4
024	26	5.10	membrane filtration	0.3	16	4.00	membrane filtration	0.1
025	17	4.12	IDEXX	-0.3	15	3.87	IDEXX	0.0
026	8	2.83	Membrane filtration	-1.2	11	3.32	Membrane filtration	-0.3
029	30	5.48	FILTRACION POR MEMBRANA	0.6	24	4.90	FILTRACION POR MEMBRANA	0.7
030	300	17.3	membrane filtration	**8.5**	100	10.0	membrane filtration	**4.1**

z-scores outside |z| >2 are shown in **bold,** see Section 5
SQRT - square root

Table 1 (continued): Results and z-Scores for Enumeration of Total Coliforms and *Escherichia coli*

laboratory number	organism							
	Total Coliforms assigned value: 4.59 SQRT cfu/100ml				*Escherichia coli* assigned value: 3.81 SQRT cfu/100ml			
	result cfu/100ml	SQRT cfu/100ml	method	z-score	result cfu/100ml	SQRT cfu/100ml	method	z-score
031	46.2	6.80	MPN	1.5	35.5	5.96	MPN	1.4
032	3.7	1.92	IDEXX , MPN	-1.8	3.4	1.84	IDEXX, MPN	-1.3
033	9	3.00	membrane filtration	-1.1	7	2.65	membrane filtration	-0.8
035	25.5	5.05	MEMBRANE FILTRATION	0.3	8.0	2.83	MEMBRANE FILTRATION	-0.7
036	30.5	5.52	MEMBRANE FILTRATION	0.6	10	3.16	MEMBRANE FILTRATION	-0.4
037	76	8.72	Membrane Filtration	**2.8**	54	7.35	Membrane Filtration	**2.4**
039	24	4.90	Membrane Filtration	0.2	16	4.00	Membrane Filtration	0.1
041	15	3.87	SM 9222 B:2023	-0.5	14	3.74	SM 9222 H:2023	0.0
043	24	4.90	Membrane filtration	0.2	16	4.00	Membrane Filtration	0.1
044	22	4.69	membrane filtration	0.1	18	4.24	membrane filtration	0.3

z-scores outside |z| >2 are shown in **bold,** see Section 5
SQRT - square root

Table 2: Results and z-Scores for Colony Count after 3 days at 22°C and after 2 days at 37°C

laboratory number	organism					
	Colony Counts (22°C/3 days) assigned value: 9.11 SQRT cfu/ml			Colony Counts (37°C/2 days) assigned value: 10.5 SQRT cfu/ml		
	result cfu/ml	SQRT cfu/ml	z-score	result cfu/ml	SQRT cfu/ml	z-score
003	78	8.83	-0.2	136	11.7	0.9
004	96	9.80	0.6	100	10.0	-0.4
008	86	9.27	0.1	165	12.8	1.9
009	40	6.32	**-2.2**	50	7.07	**-2.7**
015	96	9.80	0.6	150	12.2	1.4
024				145	12.0	1.2
027	83	9.11	0.0	104	10.2	-0.2
028	170	13.0	**3.1**	120	11.0	0.4
035	80	8.94	-0.1	120	11.0	0.4
039				105	10.2	-0.2
040	80	8.94	-0.1	90	9.49	-0.8
042				110	10.5	0.0
043				105	10.2	-0.2

z-scores outside |z| >2 are shown in **bold,** see Section 5
SQRT - square root

Table 3: Results and z-Scores for Enumeration of Enterococci

laboratory number	organism			
	Enterococci assigned value: 5.17 SQRT cfu/100ml			
	result cfu/100ml	SQRT cfu/100ml	method	z-score
003	32	5.66	Membran Filtrasyon	0.4
005	8	2.83	membrane filtration	-1.9
009	16	4.00	membrane filtration	-0.9
011				
013				
014				
015	43	6.56	membrane filtration	1.1
016	42	6.48	Enterolert-DW	1.0
020				
024				
025	10	3.16	IDEXX	-1.6
034	20	4.47	ISO 7899-2: 2000	-0.6
035	21.5	4.64	MEMBRANE FILTRATION	-0.4
036	33.0	5.74	MEMBRANE FILTRATION	0.5
038	36	6.00	ISO 7899-2	0.7
039	22	4.69	Membrane Filteration	-0.4
044	38	6.16	Membrane filtration	0.8

z-scores outside |z| >2 are shown in **bold,** see Section 5
SQRT - square root

Table 4: Results and z-Scores for Enumeration of *Pseudomonas aeruginosa*

laboratory number	organism			
	Pseudomonas aeruginosa assigned value: 4.64 SQRT cfu/100ml			
	result cfu/100ml	SQRT cfu/100ml	method	z-score
003	25	5.00	Membran Filtrasyon	0.2
005	11	3.32	membrane filtration	-0.9
009				
011	15	3.87	membrane filtration	-0.5
013	22	4.69	Membrane Filtration	0.0
014	7	2.65	membrane filtration	-1.3
015	49	7.00	membrane filtration	1.6
016	38.5	6.20	Pseudalert	1.0
020	75	8.66	membrane filtration	**2.7**
024	25	5.00	membrane filtration	0.2
025				
034	7	2.65	ISO 16266: 2006	-1.3
035	26.5	5.15	MEMBRANE FILTRATION	0.3
036	20.5	4.53	MEMBRANE FILTRATION	-0.1
038	3	1.73	ISO 16266	-1.9
039				
044	21	4.58	Membrane filtration	0.0

z-scores outside |z| >2 are shown in **bold,** see Section 5
SQRT - square root

Table 5: Results and z-Scores for Enumeration of *Clostridium perfringens*

laboratory number	organism			
	Clostridium perfringens assigned value: 4.78 SQRT cfu/100ml			
	result cfu/100ml	SQRT cfu/100ml	method	z-score
003				
005				
009				
011				
013				
014				
015	30	5.48	membrane filtration	0.5
016				
020				
024				
025				
034	27	5.20	ISO 14189: 2013	0.3
035				
036	12.5	3.54	MEMBRANE FILTRATION	-0.8
038	19	4.36	ISO 14189	-0.3
039				
044				

z-scores outside |z| >2 are shown in **bold,** see Section 5
SQRT - square root

Table 6: Participants' Comments

Test Material A

laboratory number	comments
005	We received the samples after 5 days from the dispatch, and the samples were warm.
019	We don't have a method to test the Total Coliforms.
026	ISO 9308-1 (2014) - Filtration of 100 ml water 0.45um filter with cromogenic coliform e.coli agar from Merck. Incubation 24 hour at 35? C. Coliform is violet until re colonies and E.coli is blue colonies.
030	1 sample received with good condition, tested on 19/08/2024
031	Colilert method, defined substrate.
032	Results given are already SQRT MPN
037	Test Method: APHA 9222 J. Simultaneous Detection of Total Coliform and E. coli by Dual-Chromogen by Membrane Filter Procedure
041	Métodos filtración de membrana
043	Membrane filtration technique used

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Test Material B

laboratory number	comments
040	Media Used : PCA

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Test Material C

laboratory number	comments
014	membrane filtration method and inoculation at cetrimide agar
034	Laboratory was accredited as per ISO 17025: 2017. Analysis has been started on 23.08.2024 and completed by 25/08/2023 for enterococci and analysis of Clostridium has been completed on 26.08.2024. Similarly Pseudomonas aeruginosa has been started on 23.08.2024 and completed on 27.08.2024.

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Table 7: Assigned Values and Standard Deviations for Proficiency

Test Material A

organism	data points, *n*	assigned value, x_a SQRT cfu/100ml	uncertainty, *u*	standard deviation for proficiency, σ_p	
Total Coliforms	28	4.59	0.21	ffp	1.500
Escherichia coli	29	3.81	0.17	ffp	1.500

ffp = fitness-for-purpose criteria
SQRT - square root

Test Material B

organism	data points, *n*	assigned value, x_a SQRT cfu/ml	uncertainty, *u*	standard deviation for proficiency, σ_p	
Colony Counts (22°C/3 days)	9	9.11	0.14	ffp	1.250
Colony Counts (37°C/2 days)	13	10.5	0.2	ffp	1.250

ffp = fitness-for-purpose criteria
SQRT - square root

Test Material C

organism	data points, *n*	assigned value, x_a SQRT cfu/100ml	uncertainty, *u*	standard deviation for proficiency, σ_p	
Enterococci	12	5.17	0.39	ffp	1.250
Pseudomonas aeruginosa	14	4.64	0.41	ffp	1.500
Clostridium perfringens	4	4.78	0.41	ffp	1.500

ffp = fitness-for-purpose criteria
SQRT - square root

Table 8: Number and Percentage of z-Scores where |z| ≤2

Test Material A

organism	number of scores where |z| ≤2	total number of scores	% |z|≤2
Total Coliforms	28	30	93
Escherichia coli	28	30	93

Test Material B

organism	number of scores where |z| ≤2	total number of scores	% |z| ≤2
Colony Counts (22°C/3 days)	7	9	78
Colony Counts (37°C/2 days)	12	13	92

Test Material C

organism	number of scores where |z| ≤2	total number of scores	% |z| ≤2
Enterococci	12	12	100
Pseudomonas aeruginosa	13	14	93
Clostridium perfringens	4	4	100

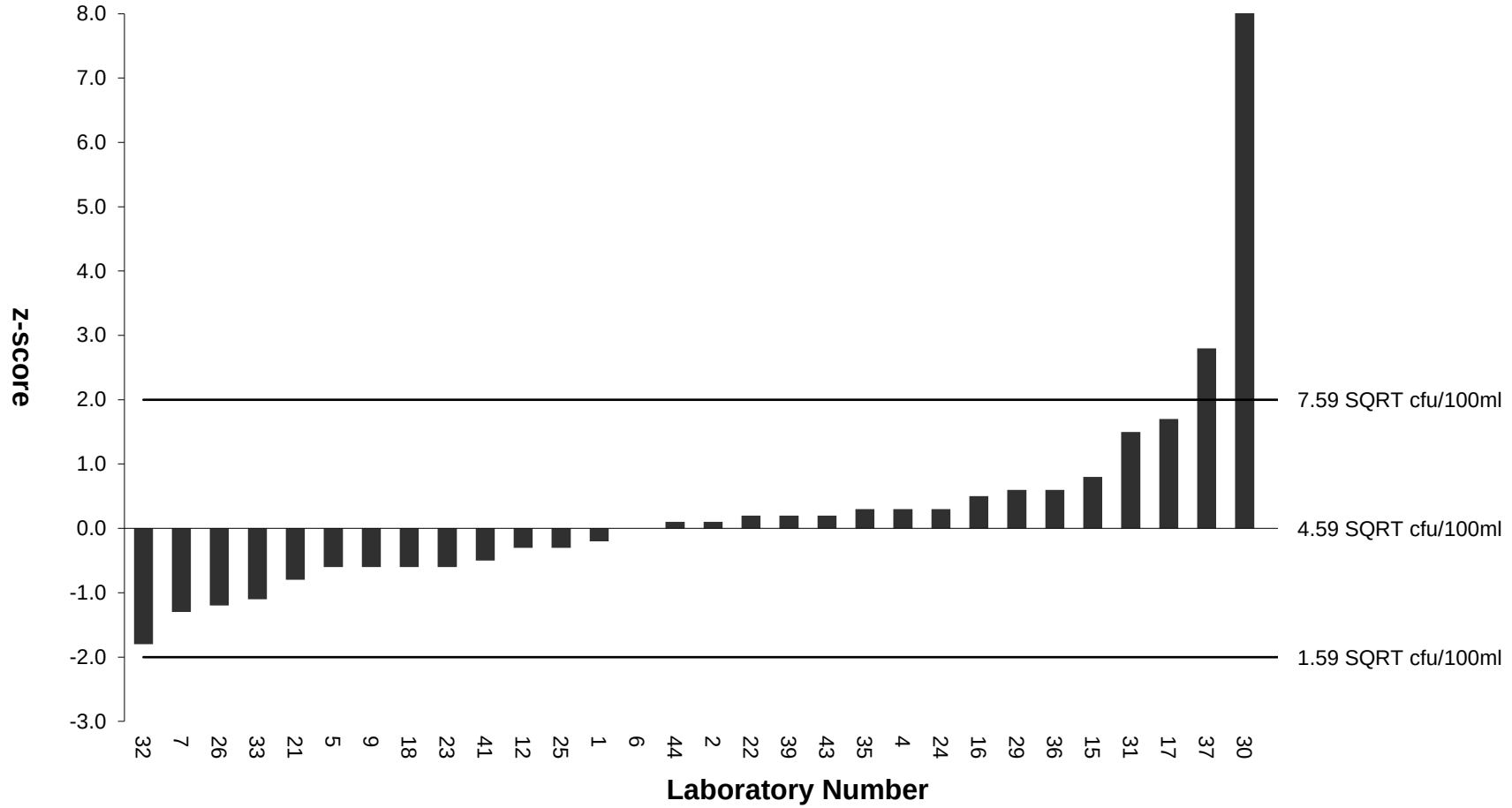

Figure 1: z-Scores for Enumeration of Total Coliforms

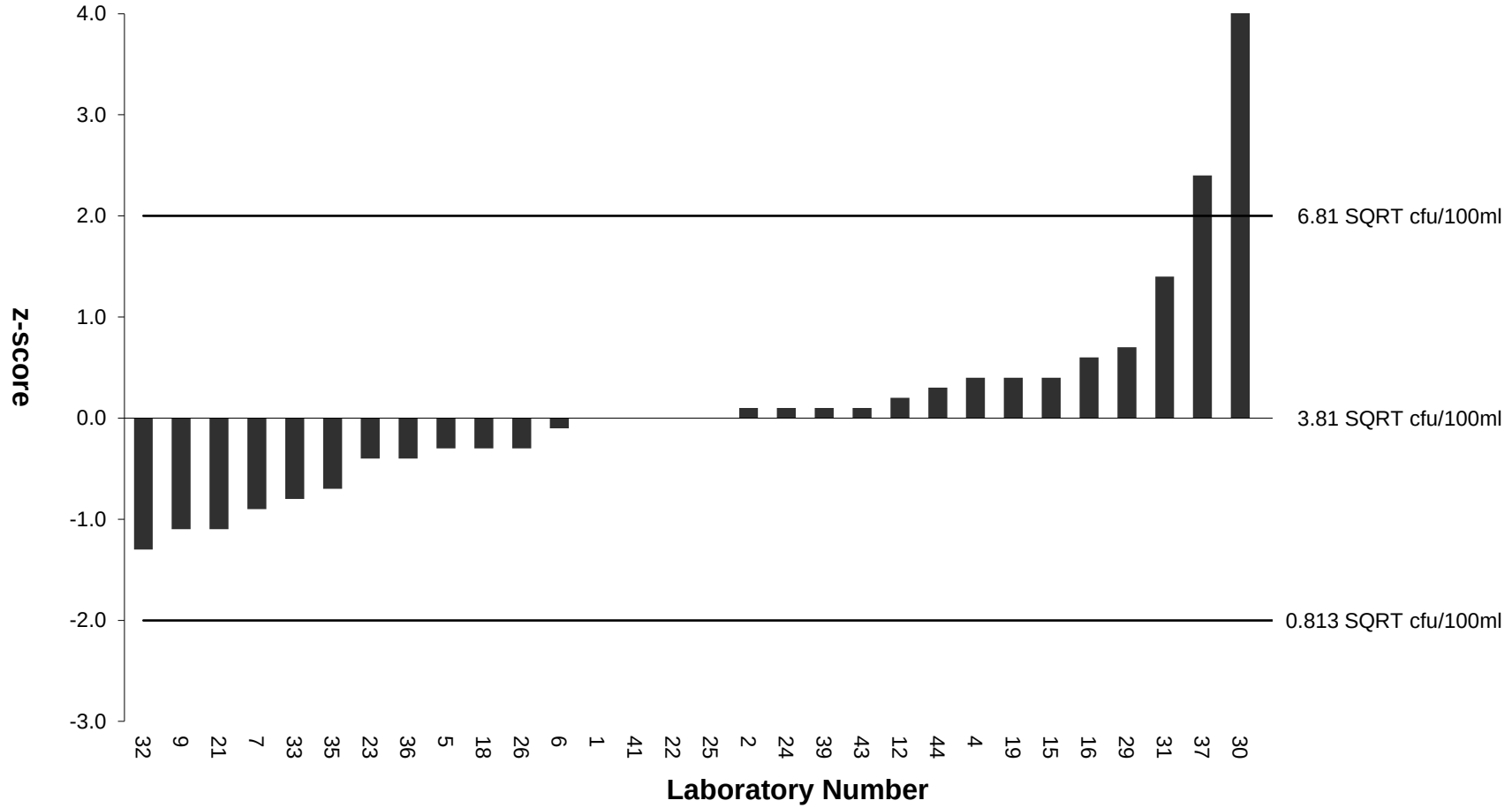

Figure 2: z-Scores for Enumeration of *Escherichia coli*

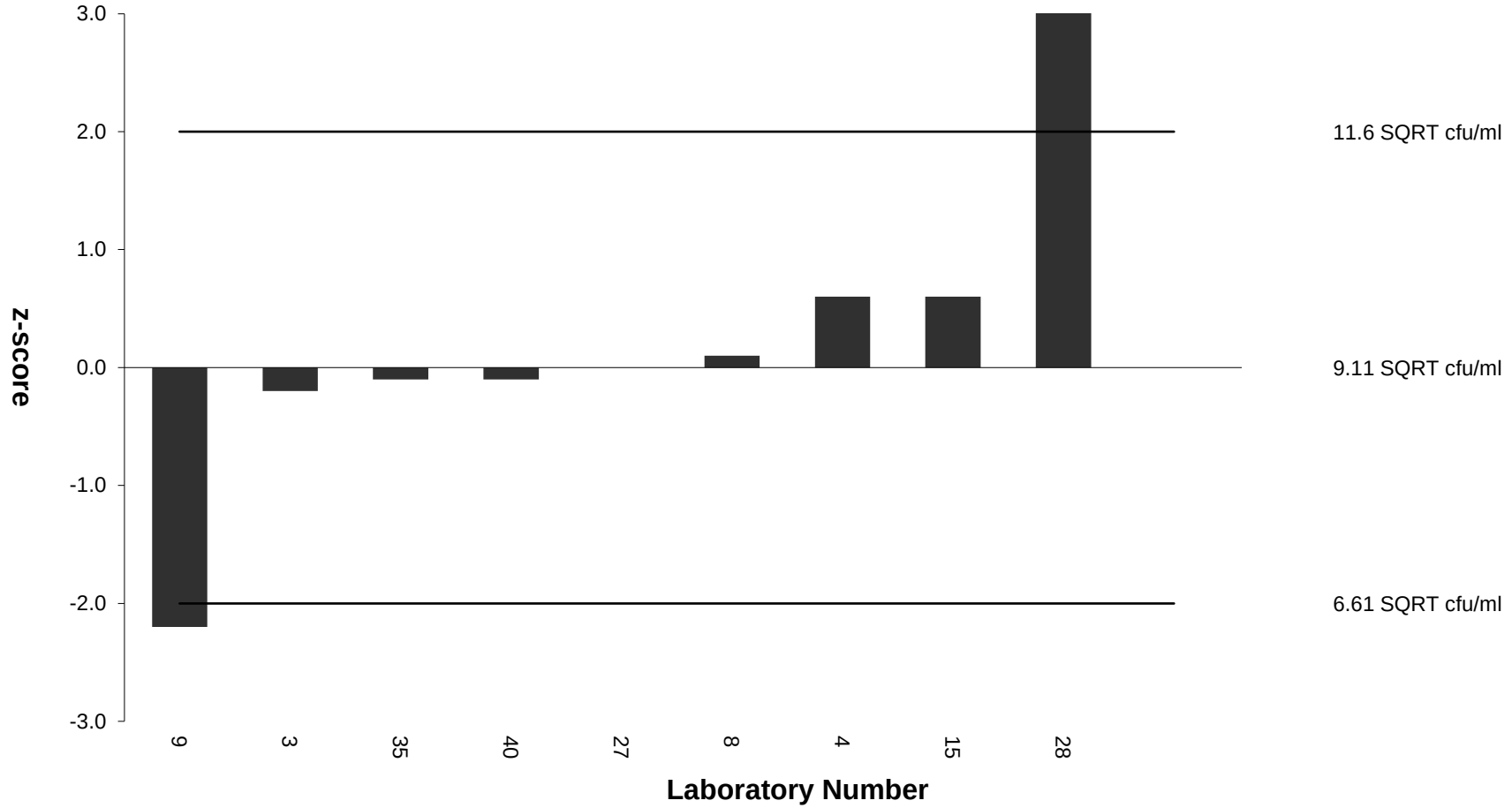

Figure 3: z-Scores for Colony Count after 3 days at 22°C

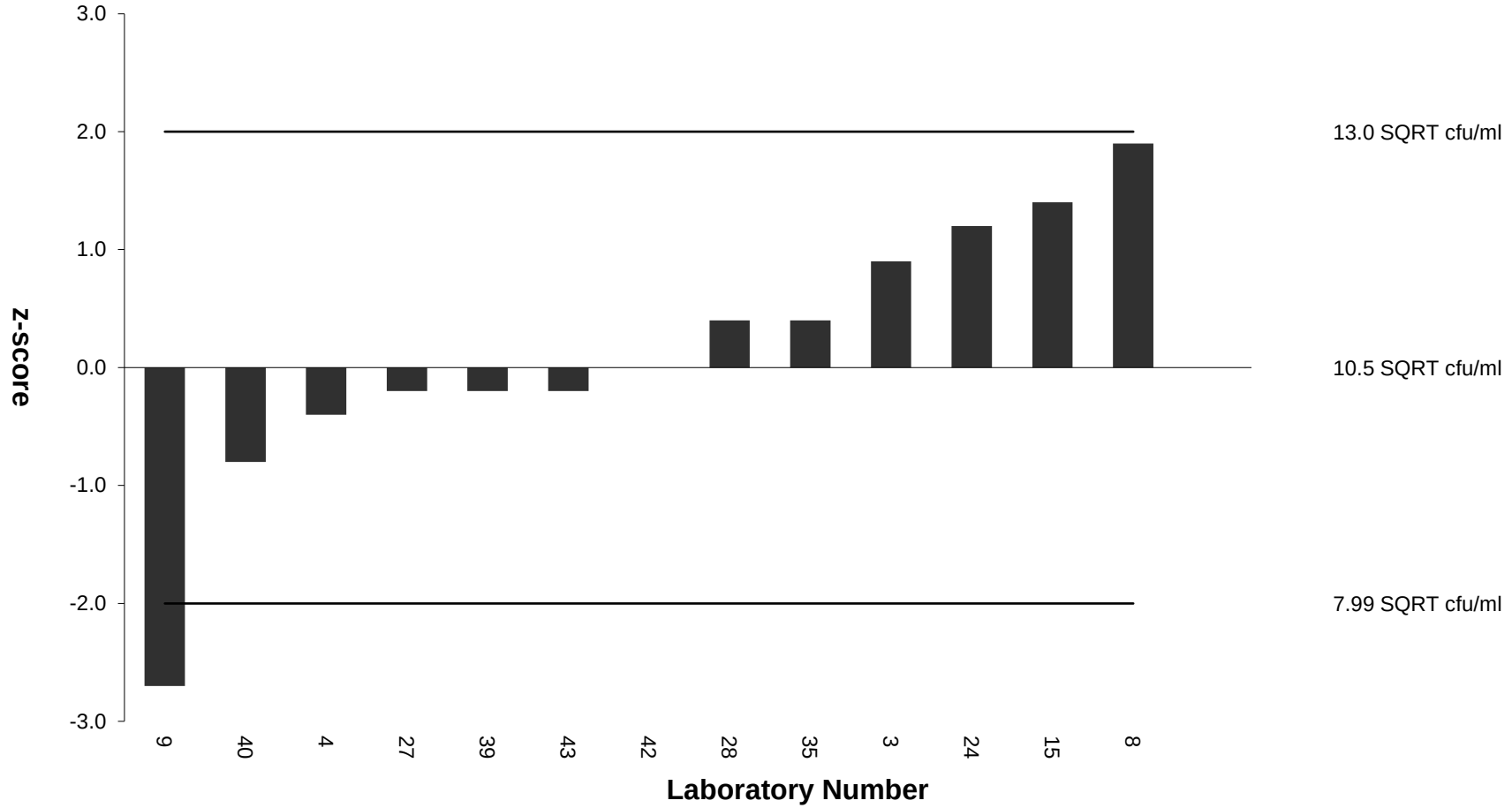

Figure 4: z-Scores for Colony Count after 2 days at 37°C

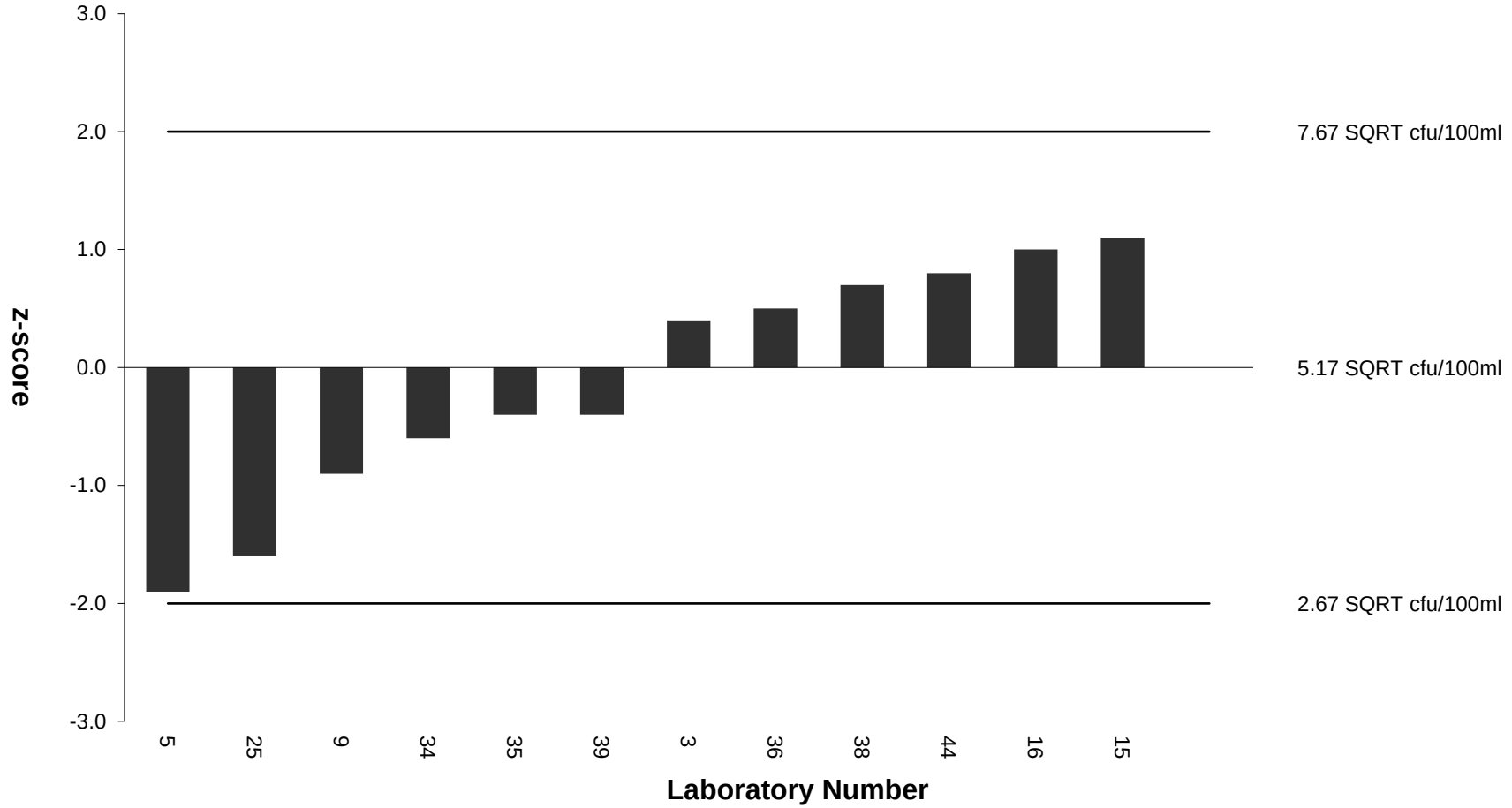

Figure 5: z-Scores for Enumeration of Enterococci

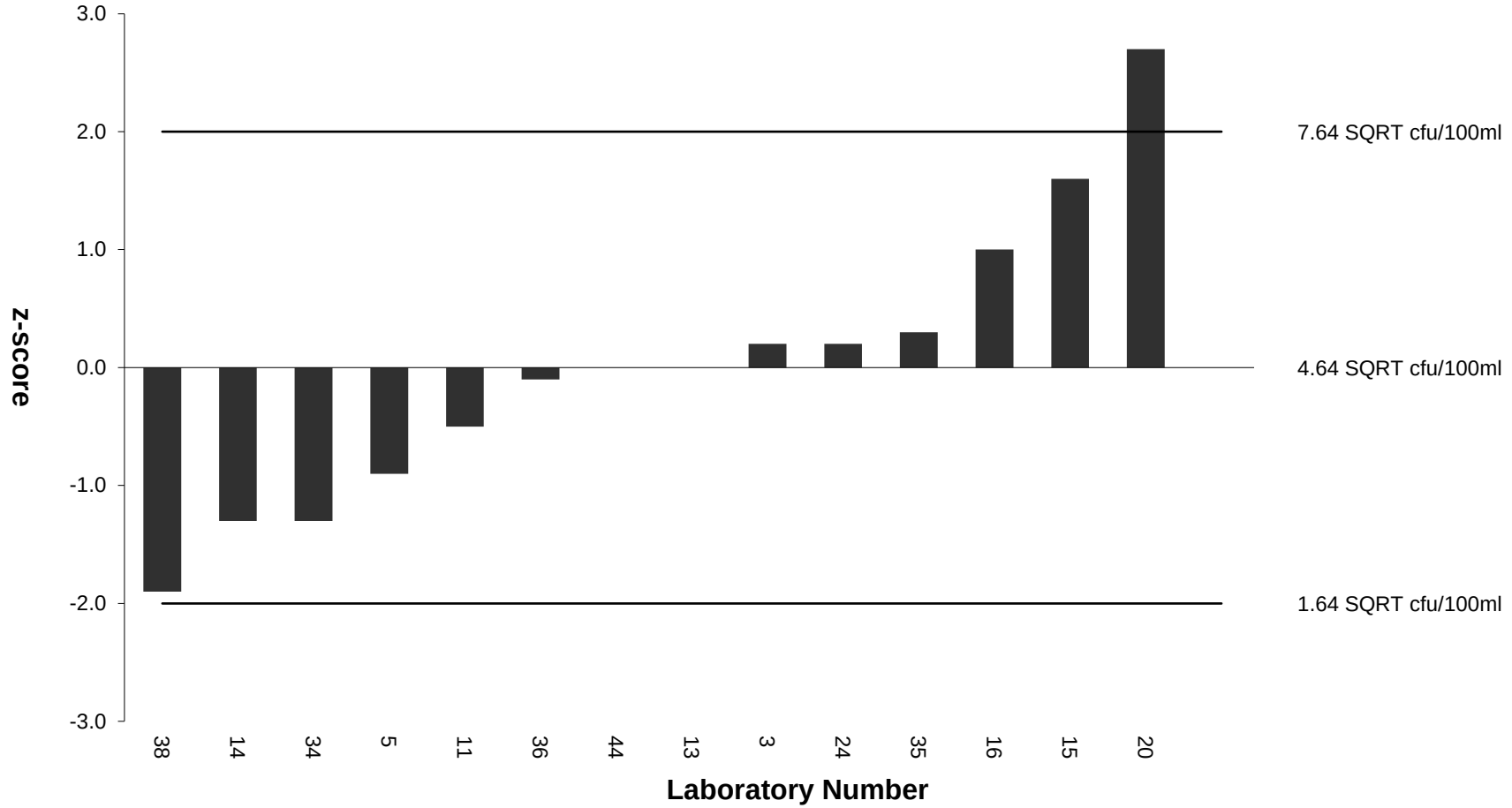

Figure 6: z-Scores for Enumeration of *Pseudomonas aeruginosa*

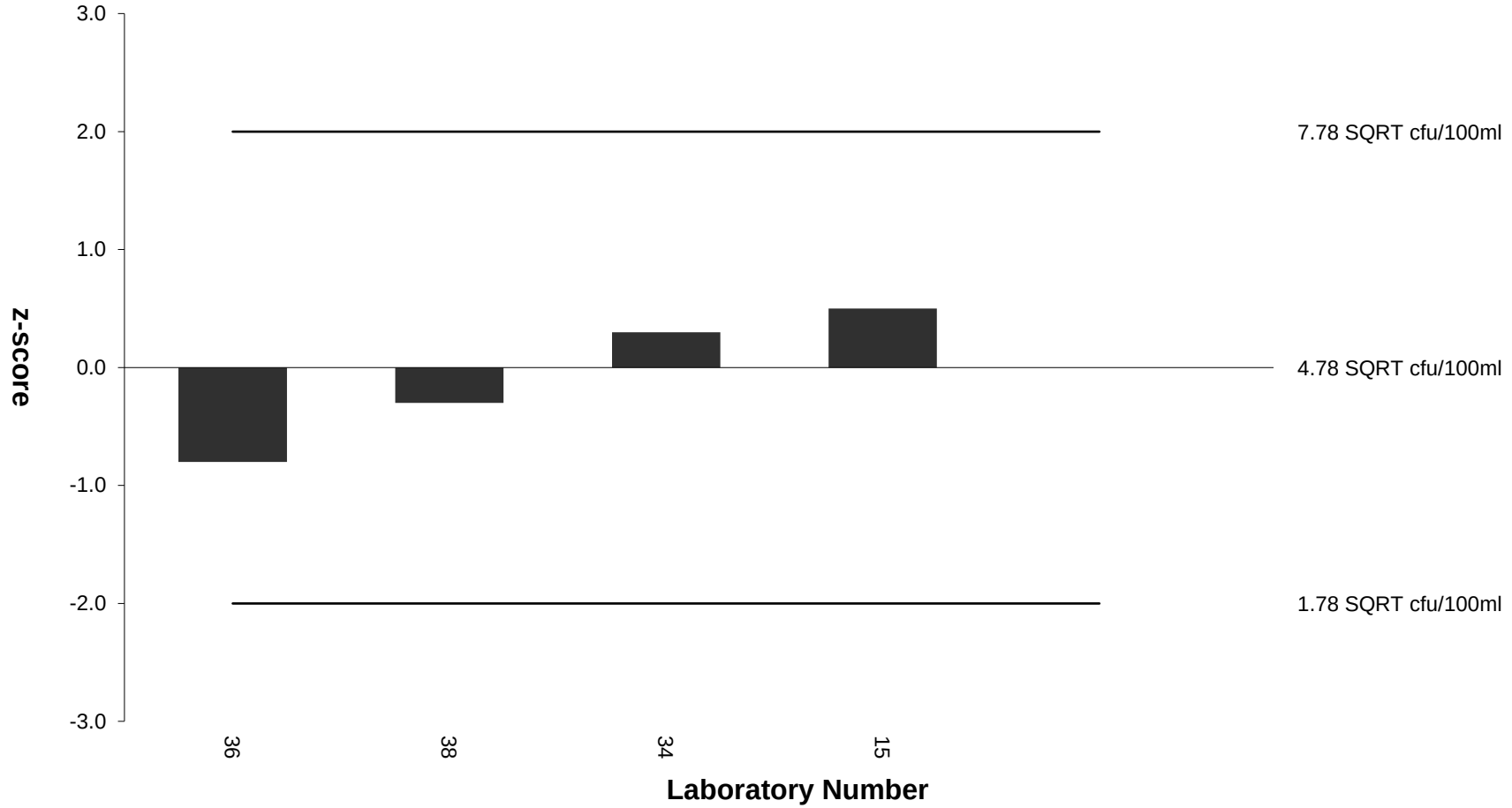

Figure 7: z-Scores for Enumeration of *Clostridium perfringens*

APPENDIX I: Methods Used by Participants

Methods are tabulated according to the information supplied by participants, but some responses may have been combined or edited for clarity. Text that appears as unreadable symbols are derived from entries made using non-Western characters.

Total Coliforms

Accredited Method Used	laboratory number
no	001 004 010 029 041
yes	002 005 006 007 009 015 017 023 024 025 026 030 031 033 035 036 037 039 043 044

National or International Standard (ISO) Used	laboratory number
ISO 9308-1:2014 (membrane filtration)	001 023 026 029 033 035 036
ISO 9308-2:2012 (MPN - most probable number)	005 007
ISO 9308-3:1998 (MPN - most probable number) (surface and waste water)	025
SCA MoDW (2009) - Part 4	015
9308:2000	009
APHA 9222 B	043
APHA 9222 J	030
APHA 9222 J (Membrane Filtration)	037
APHA 9222H	002
APHA 9222J	024
APHA-9222 B	039
FDA BAM	010
HACH METHOD 8074	006
ISO17025 : 2017	004
SM 9223 B, 24th Edition, 2023	031
SMEWW 9222K	044
Standard Methods for Examination of Water and Waste Water 24th Edition, 9222B	017
Standard Methods for the examination of water and wastewater Edition 2023 - 9222 B	041

If the method is not an ISO Standard, state a reference for the method.	laboratory number
APHA	024
APHA 9222 B	004 043
APHA 9222 J	030
APHA-9222 B	039
Coliformes totales: SM 9222 B:2023	041
NA	037
SM 9223 B, 24th Edition, 2023	031
Standard Methods for Examination of Water and Waste Water 24th Edition, 9222B	017

Method	laboratory number
membrane filtration	001 002 004 006 009 015 017 023 024 026 029 030 033 035 036 037 039 041 043 044
Colilert-18	005 007 025
Colilert	031
spread plate compact dry	010

Media	laboratory number
Colilert-18	005 007 018 025
Membrane Lactose Glucoronide Agar (MLGA)	015
Chromogenic Coliform Agar (CCA)	001 002 009 023 026 029 030 033 035 036
Agar Endo LES	041
Colilert	031
compact dry	010
M endo agar	043
M-coli blue	024
mColiBlue24 Broth	037
M-Endo	004
mEndo Agar	017
m-Endo Agar LES	039
m-ENDO BROTH	006

Incubation Time (hours) / Incubation Temperature (°C)	laboratory number
4/30 then 14/37	015
18/24	031
18/35	007
24/35	006 030 037 039 043
24/36	001
24/37	009 036
24/37 C	004
24H/35C	024
24hrs/35 degrees	017
35 ± 0.5	002
35 C	044
35°C	041
36±2°C/21-24h	023
37/24	035
48/35	010
Incubation Time 18-22 Hours / Incubation Temp 35C	005

Confirmation of the identity	laboratory number
no	001 002 004 005 007 009 010 025 029 031 035 036
yes	006 015 017 023 024 026 030 037 039 041 043

Number of colonies used for confirmation	laboratory number
10	015 023
10 colonias	041
10 red colonies	037
3	030
4	039
5	006 017 024 043
8 for Coliform	026
not detected	010

Confirmation Tests	laboratory number
Oxidase	015 023 037
Indole	015 030 037
Lactose fermentation	015 017 037 043
API	039
BGLB	024
EMB AGAR	006
KB016 Hi24 Enterobacteriaceae Identification Kit	037
observation violet colonies in cromogenic coliform e.coli agar medium	026
spread plate method	010

Confirmation (Selective Media)	laboratory number
Brilliant Green Bile Broth (BGBB)	017 024 030 037 041 043
Lactose Peptone Water	015
API Kit	039
CCA	026
compact dry	010
EMB AGAR	006
Tryptic Soy agar (TSA)	023

Escherichia coli

Accredited Method Used	laboratory number
no	001 004 010 029 041
yes	002 005 006 007 009 015 023 024 025 026 030 031 033 035 036 037 039 043 044

National or International Standard (ISO) Used	laboratory number
ISO 9308-1:2014 (membrane filtration)	001 023 026 029 033 035 036
ISO 9308-2:2012 (MPN - most probable number)	005 007
ISO 9308-3:1998 (MPN - most probable number) (surface and waste water)	025
SCA MoDW (2009) - Part 4	015
9308:2000	009
APHA 9222 D	043
APHA 9222 J	030 037
APHA 9222H	002
APHA 9222J	024
APHA-9222 D	039
FDA BAM	010
HACH METHOD 10029	006
SM 9223 B, 24th Edition, 2023	031
Standard Methods for the examination of water and wastewater Edition 2023 - 9222 H	041

If the method is not an ISO Standard, state a reference for the method.	laboratory number
APHA	024
APHA 9222 D	043
APHA 9222 I	004
APHA 9222 J	030
APHA-9222-D	039
Coliformes totales: SM 9222 H:2023	041
NA	037
SM 9223 B, 24th Edition, 2023	031

Method	laboratory number
membrane filtration	001 002 004 006 009 015 023 024 026 029 030 033 035 036 037 039 041 043
Colilert-18	005 007 025
Colilert	031
spread plate compact dry	010

Media	laboratory number
Colilert-18	005 018 025
Membrane Lactose Glucoronide Agar (MLGA)	015
Chromogenic Coliform Agar (CCA)	001 002 009 023 026 029 030 033 035 036
Agar Endo LES	041
Colilert	031
compact dry	010
M-coli blue	024
m-COLIBLUE24	006
mColiBlue24 Broth	037
m-FC Agar	039
NA-MUG	004

Incubation Time (hours) / Incubation Temperature (°C)	laboratory number
4/30 then 14/37	015
18/24	031
18/35	007
24/35	006 010 030 037
24/37	009 036
24/44.5	039
24h/35c	024
35 ± 0.5	002
35°C - 44,5°C	041
36±2°C/21-24h	023
37/24	035
4/37 C	004
Incubation Time 18-22 Hours / Incubation Temp 35C	005

Confirmation of the identity	laboratory number
no	004 007 009 010 025 029 031 035 036
yes	006 015 023 024 026 030 037 039 041 043

Number of colonies used for confirmation	laboratory number
1	030
10	015 023
10 blue colonies	037
10 colonias	041
11 for E.coli	026
4	039
5	006 024 043
not detected	010

Confirmation Tests	laboratory number
Oxidase	015 023 037
Indole	015 030 037 043
Lactose fermentation	015 037
API	024 039
EMB AGAR	006
KB010 HiE.Coli Identification Kit	037
spread plate method	010

Confirmation (Selective Media)	laboratory number
Brilliant Green Bile Broth (BGBB)	030 037
Lactose Peptone Water	015
TBX	024
API	039
Caldo EC MUG	041
compact dry	010
EMB AGAR	006
Tryptic Soy agar (TSA)	023
Tryptone Water	043

Colony Counts (22°C/3 days)

Accredited Method Used	laboratory number
no	004 028 040
yes	003 009 015 027 035

National or International Standard (ISO) Used	laboratory number
ISO 6222:1999	003 009 035 040
SCA MoDW (2012) - Part 7	015
ISO 17025:2017	004
USP (United States Pharmacopeia)	028

If the method is not an ISO Standard, state a reference for the method.	laboratory number
APHA 9215 D	004
USP <61> Microbiological examination of nonsterile products: microbial enumeration tests.	028

Method	laboratory number
Pour plate	003 009 015 028 035 040
Membrane Filtration	004

Media	laboratory number
Plate Count Agar (PCA)	027 040
Yeast Extract Agar (YEA)	003 009 015 035
M-HPC	004
Tryptic soy agar	028

Colony Counts (37°C/2 days)

Accredited Method Used	laboratory number
no	028 040
yes	003 004 009 015 024 027 035 039 042 043

National or International Standard (ISO) Used	laboratory number
ISO 6222:1999	003 009 035 040
SCA MoDW (2012) - Part 7	015
APHA 9215 B	039
Indian Standard (IS 5402)	042
ISO 17025:2017	004
ML-TR -SOP-027 (inhouse)	024
USP <1231>	043

If the method is not an ISO Standard, state a reference for the method.	laboratory number
APHA 9215 B	039
APHA 9215 D	004
In house	024
Indian Standard (IS 5402)	042
Total Colony Counts in 35 ?-Pour Plate Method	028
united states pharmacopeia	043

Method	laboratory number
Pour plate	003 009 015 024 028 035 039 040 042
Membrane Filtration	004 043

Media	laboratory number
Plate Count Agar (PCA)	024 027 028 039 040 042
Yeast Extract Agar (YEA)	003 015 035
R2A Agar	043
M-HPC	004

Enterococci

Accredited Method Used	laboratory number
yes	005 009 015 025 034 035 036 038 039 044

National or International Standard (ISO) Used	laboratory number
ISO 8199:2005	025
ISO 7899-2:2000	009 034 035 036 038
SCA MoDW (2012) - Part 5	015
APHA 9230 C	039

If the method is not an ISO Standard, state a reference for the method.	laboratory number
-	034
APHA 9230 C	039

Method	laboratory number
membrane filtration	005 009 015 034 035 036 038 039 044
Enterolert	025

Media	laboratory number
Slanetz and Bartley Agar	009 015 034 035 036 038 039

Incubation Time (hours) / Incubation Temperature (°C)	laboratory number
24/41	025
48/37	005 009 015 034 035 036 038
37 C	044
48/35	039

Confirmation of the identity	laboratory number
no	005 009 025
yes	015 034 035 036 038 039

Number of colonies used for confirmation	laboratory number
10	015
12	038
3	039
45 colonies taken for confirmation from a total of 220mL of water.	034
ALL	035 036

Confirmation Tests	laboratory number
Aesculin hydrolysis by sub-culture	015
Aesculin hydrolysis by membrane transfer	034 035 036 038
Catalase reaction	039

Pseudomonas aeruginosa

Accredited Method Used	laboratory number
yes	005 013 014 015 020 024 034 035 036 038 044

National or International Standard (ISO) Used	laboratory number
ISO 16266:2006	005 013 014 020 034 035 036 038
SCA MoDW (2010) - Part 8	015
ML-TR-SOP-029 (inhouse)	024
SWEWW 9213 E	044

If the method is not an ISO Standard, state a reference for the method.	laboratory number
-	034
ML-TR-SOP-029	024

Method	laboratory number
membrane filtration	005 013 014 015 020 024 034 035 036 038

Media	laboratory number
Pseudomonas Agar with CFC supplement	015 034
Pseudomonas Agar with CN supplement	013 020 035 036 038
cetrimide agar	014

Incubation Time (hours) / Incubation Temperature (°C)	laboratory number
48/37	005 013 015 020 034 035 036 038
72/35	014

Confirmation of the identity	laboratory number
no	035 036
yes	013 014 015 020 024 034 038

Number of colonies used for confirmation	laboratory number
10	013 015 034
3	038
5	024
65	020
no	014

Confirmation Tests	laboratory number
Oxidase	013 015 020 034 038
API 20 NE	024
ACETAMIDE BROTH AND KING'S B AGAR	013

Clostridium perfringens

Accredited Method Used	laboratory number
no	015 036
yes	034 038

National or International Standard (ISO) Used	laboratory number
ISO 14189:2013 (membrane filtration)	034 036 038
SCA MoDW (2010) - Part 6	015

If the method is not an ISO Standard, state a reference for the method.	laboratory number
-	034

Method	laboratory number
membrane filtration	015 034 036 038

Media	laboratory number
Tryptose Sulphite Cycloserine Agar (TSC) with egg	034
Tryptose Sulphite Cycloserine Agar (TSC) without egg	015 036 038

Incubation Time (hours) / Incubation Temperature (°C)	laboratory number
21/37	038
21/44	015 034 036

Confirmation of the identity	laboratory number
no	036
yes	015 034 038

Number of colonies used for confirmation	laboratory number
10	015 034
8	038

Confirmation Tests	laboratory number
Nitrate/nitrite reduction	038
acid phosphatase reaction	015 034

Method (LEAP acid phos.)	laboratory number
by dropping reagent on the colonies	034 038

APPENDIX II: Fapas® SecureWeb, Protocol and Contact Details

1. Fapas® SECUREWEB

Access to the secure area of our website is only available to participants in our proficiency tests. Please contact us if you require a UserID and Password. Fapas® SecureWeb allows participants to:

- Obtain their laboratory numbers for the proficiency tests in which they have participated.
- View the results they submitted in past and current proficiency tests.
- Submit their results and methods for current tests.
- Review future tests they have ordered.
- Order proficiency tests, reference materials and quality control materials.
- Freely download copies of reports (PDF file), of proficiency tests in which they have participated.
- View charts of their z-scores obtained in previous Fapas® – Water Microbiology proficiency tests.

2. PROTOCOL

The Protocols [7, 8] set out how Fapas® – Water & Environmental is organised. Copies can be downloaded from our website.

3. CONTACT DETAILS

This report was prepared and authorised on behalf of Fapas® by Stilian Hristov (Round Coordinator). Participants with any comments or concerns about this proficiency test should contact:

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