



Fapas® – Water and Environmental Report DWM095

Drinking Water Microbiology

July-August 2025

PARTICIPANT LABORATORY NUMBER

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SUMMARY

1. The test materials for Fapas[®] – Drinking Water Microbiology proficiency test Distribution DWM095 were dispatched in July 2025. The test materials available in this Distribution were for the following proficiency tests:

DW095m01: Enumeration of total coliforms and *Escherichia coli*.

DW095m02: Colony count after 3 days at 22°C and Colony Counts after 2 days at 37°C,

DW095m03: Enumeration of enterococci, *Clostridium perfringens*, *Clostridium* spp., Sulphite Reducing Clostridia and *Pseudomonas aeruginosa*,

DW095m04 Organism Identification.

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. However, it was not possible to set an assigned value for *Clostridium* spp.
3. Results for this proficiency test are summarised as follows:

DW095m01

organism	assigned value, x_a SQRT cfu/100ml	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Total Coliforms	4.22	15	17	88
<i>Escherichia coli</i>	3.46	20	20	100

SQRT - square root

DW095m02

organism	assigned value, x_a SQRT cfu/ml	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Colony Counts (22°C/3 days)	9.48	5	6	83
Colony Counts (37°C/2 days)	9.80	8	10	80

SQRT - square root

DW095m03

organism	assigned value, x_a SQRT cfu/100ml	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Enterococci	7.54	18	19	95
<i>Pseudomonas aeruginosa</i>	4.61	19	19	100
<i>Clostridium perfringens</i>	5.52	9	10	90
<i>Clostridium</i> spp.	not set	n/a	n/a	n/a
Sulphite Reducing Clostridia (SRC)	5.83	11	11	100

SQRT - square root

n/a - not applicable

DW095m04

examination	intended result	number of satisfactory results	total number of results	% satisfactory results
organism identification	<i>Serratia marcescens</i>	4	4	100

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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:

DW092m01	<i>Escherichia coli</i> and <i>Klebsiella planticola</i> ,
DW092m02	<i>Enterococcus faecalis</i> and <i>Staphylococcus epidermidis</i> ,
DW092m03	<i>Enterococcus faecalis</i> , <i>Pseudomonas aeruginosa</i> , and <i>Clostridium perfringens</i> ,
DW095m04	<i>Serratia marcescens</i> .

The test materials were stored at $+4\pm2.5^{\circ}\text{C}$ 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.

The organism present in DW095m04 was verified as being *Serratia marcescens* by a laboratory meeting the quality requirements of the scheme's accreditation [3], using an appropriate method.

2.3. Dispatch

The start date was 16 July 2025. Test materials were sent to 53 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 $+4\pm 2^{\circ}\text{C}$ until analysis.
- For proficiency tests DW095m01, DW095m03
Results for Total Coliforms, *Escherichia coli*, Enterococci, *Clostridium perfringens*, *Clostridium* spp., Sulphite Reducing Clostridia and *Pseudomonas aeruginosa* must be reported in cfu/100ml.
- For proficiency test DW095m02:
Results for colony counts must be reported in cfu/ml.
- For proficiency test DW095m04:
Report the identity of the organism in full, i.e. to species level but if your routine method does not give this level of detail then report the identity to the genus level.

Results were submitted by 47 participants (89%) before the closing date for this test, 06 August 2025.

Each participant was given a laboratory number, assigned in order of receipt of results. The reported results are given in Tables 1 to 6.

Participants' comments are given in Table 7.

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 $\times$ greater or smaller than the majority of submitted results (as these were considered to be reporting errors).

For total coliforms, *Escherichia coli*, enterococci and *Pseudomonas aeruginosa* examinations 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, *Clostridium perfringens* and sulphite reducing clostridia 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.

No assigned value has been set for the enumeration of *Clostridium* spp. as there were insufficient data points.

The assigned values for all proficiency tests in enumeration with exception of those for *Clostridium* spp., together with their uncertainties are shown in Table 8.

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 8.

4.3. Individual z-Scores and Assessments

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 8,

and σ_p = the standard deviation for proficiency, see Table 8.

Participants' z-scores for all proficiency tests in enumeration are given in Tables 1 to 5 and shown as histograms in Figures 1-8. 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 8.

The number and percentage of z-scores in the range $-2 \leq z \leq 2$ for all proficiency tests in enumeration with the exception of those for *Clostridium* spp. are given in Table 9.

Participants' results for the organism identification test are assessed based on the correct identification to species level, however if a laboratory's routine method does not give this level of detail, then they may report the identity to the genus level. Assessments are given in Table 6.

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].

Results submitted by participants for organism identification tests are assessed as either satisfactory (S) or not satisfactory (NS) as compared to the intended result.

The number and percentage of satisfactory assessments are given in Table 10.

6. REFERENCES

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- 7 Fapas®, 2025, Protocol for Proficiency Testing Schemes, Version 10, January 2025, 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: 4.22 SQRT cfu/100ml				<i>Escherichia coli</i> assigned value: 3.46 SQRT cfu/100ml			
	result	SQRT	method	z-score	result	SQRT	method	z-score
007	27	5.20	Filtracion por membrana	0.7	14	3.74	Filtracion por membrana	0.2
009	23	4.80	MPN	0.4	17	4.12	MPN	0.4
016	116	10.8	3M	4.4	1	1.00	3M	-1.6
017					16	4.00	Membrane filtration	0.4
019	13	3.61	membrane filtration	-0.4	6	2.45	membrane filtration	-0.7
021	79	8.89	MPN	3.1	27	5.20	MPN	1.2
022	12	3.46	Membrane Filtration	-0.5	7	2.65	Membrane Filtration	-0.5
023	9	3.00	membrane filtration	-0.8	7	2.65	membrane filtration	-0.5
026	6.00	2.45	Membrane Filtration	-1.2	6.00	2.45	Membrane Filtration	-0.7
028	12	3.46	membrane filtration	-0.5	9	3.00	membrane filtration	-0.3

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

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

laboratory number	organism							
	Total Coliforms assigned value: 4.22 SQRT cfu/100ml				<i>Escherichia coli</i> assigned value: 3.46 SQRT cfu/100ml			
	result	SQRT	method	z-score	result	SQRT	method	z-score
029					11	3.32	Membrane filtration	-0.1
030	22	4.69	membrane filtration	0.3	19	4.36	membrane filtration	0.6
031	17	4.12	FILTRACI N POR MEMBRANA	-0.1	10	3.16	FILTRACI N POR MEMBRANA	-0.2
035					19	4.36	Filtration	0.6
038	Detected		APHA9221 B&D		Detected		APHA9221E &F	
040	20	4.47	APHA 9222 B	0.2	12	3.46	APHA 9222 G	0.0
042	11	3.32	membrane filtration	-0.6	9	3.00	membrane filtration	-0.3
043	10	3.16	Membrane Filtration Method	-0.7	7.4	2.72	Colilert-18 (IDEXX, MPN)	-0.5
045	8	2.83	MPN	-0.9	8	2.83	MPN	-0.4
046	31	5.57	MPN	0.9	21	4.58	MPN	0.7
047	26	5.10	Membrane Filtration	0.6	17	4.12	Membrane Filtration	0.4

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

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: 9.48 SQRT cfu/ml			Colony Counts (37°C/2 days) assigned value: 9.80 SQRT cfu/ml		
	result	SQRT	z-score	result	SQRT	z-score
019	36	6.00	-2.8	47	6.86	-2.4
021				93	9.64	-0.1
027	99	9.95	0.4	96	9.80	0.0
032	54	7.35	-1.7	50	7.07	-2.2
034				110	10.5	0.6
035				104	10.2	0.3
038	109	10.4	0.8	103	10.1	0.3
041				105	10.2	0.4
042	82	9.06	-0.3	89	9.43	-0.3
047	98	9.90	0.3	96	9.80	0.0

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

Table 3: Results and z-Scores for Enterococci

laboratory number	organism			
	Enterococci			
	assigned value: 7.54 SQRT cfu/100ml			
	result	SQRT	method	z-score
003	50	7.07	MF	-0.4
005	69	8.31	membrane filtration	0.6
006	64	8.00	membrane filtration	0.4
010	48	6.93	membrane filtration	-0.5
011	62	7.87	PN-EN ISO 7899-2:2004	0.3
012				
013	56	7.48	Membrane filtration	0.0
014	49	7.00	membrane filtration	-0.4
015	55	7.42	iso 7899-2	-0.1
018				
020	55	7.42	Membrane filtration	-0.1
024				
025	46	6.78	Membrane Filtration	-0.6
029	59	7.68	Membrane filtration	0.1
033				
035	55	7.42	Filtration	-0.1
036	51	7.14	membrane filtration	-0.3
037	47	6.86	membrane filtration	-0.5
038	Detected		APHA 9230D	
039	110	10.5	membrane filtration	2.4
040	53	7.28	APHA 9230 C	-0.2
042	72	8.49	membrane filtration	0.8
044	61	7.81	membrane filtration	0.2
046				
047	62	7.87	Membrane Filtration	0.3

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

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

laboratory number	organism			
	<i>Pseudomonas aeruginosa</i> assigned value: 4.61 SQRT cfu/100ml			
	result	SQRT	method	z-score
003	23	4.80	MF	0.1
005	20	4.47	membrane filtration	-0.1
006	32	5.66	membrane filtration	0.7
010	43	6.56	membrane filtration	1.3
011				
012	31	5.57	MPN	0.6
013				
014	19	4.36	membrane filtration	-0.2
015	17	4.12	iso 16266	-0.3
018	25	5.00	filtration	0.3
020	24	4.90	Membrane filtration	0.2
024				
025	17	4.12	Membrane Filtration	-0.3
029				
033				
035	20	4.47	Filtration	-0.1
036	16	4.00	membrane filtration	-0.4
037	17	4.12	membrane filtration	-0.3
038	<1		CCFRA2.5.1:2003	
039	37	6.08	membrane filtration	1.0
040	19	4.36	APHA 9213 E	-0.2
042	18	4.24	membrane filtration	-0.2
044	22	4.69	membrane filtration	0.1
046	14	3.74	MPN	-0.6
047	4	2.00	MPN	-1.7

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

Table 5: Results and z-Scores for *Clostridium perfringens*, *Clostridium* spp. and Sulphite Reducing Clostridia

laboratory number	organism										
	<i>Clostridium perfringens</i> assigned value: 5.52 SQRT cfu/100ml				<i>Clostridium</i> spp. assigned value: not set			Sulphite Reducing Clostridia (SRC) assigned value: 5.83 SQRT cfu/100ml			
	result	SQRT	method.	z-score	Result cfu/100ml	SQRT	method.	result	SQRT	method	z-score
003											
005	42	6.48	membrane filtration	0.6				44	6.63	membrane filtration	0.5
006								33	5.74	membrane filtration	-0.1
010								34	5.83	membrane filtration	0.0
011								52	7.21	PN-EN 26461-2:2001 z wylaczeniem pkt.9.2	0.9
012											
013											
014											
015											
018											
020	60	7.75	Membrane filtration	1.5				64	8.00	Membrane filtration	1.4
024	44	6.63	membrane filtration	0.7							

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5
 where no assigned value or z-scores issued, see Section 4.1
 SQRT - square root

Table 5 (continued): Results and z-Scores for *Clostridium perfringens*, *Clostridium* spp. and Sulphite Reducing Clostridia

laboratory number	organism										
	<i>Clostridium perfringens</i> assigned value: 5.52 SQRT cfu/100ml				<i>Clostridium</i> spp. assigned value: not set			Sulphite Reducing Clostridia (SRC) assigned value: 5.83 SQRT cfu/100ml			
	result	SQRT	method	z-score	Result cfu/100ml	SQRT	method	result	SQRT	method	z-score
025											
029											
033								31	5.57	Membrane filtration	-0.2
035											
036	26	5.10	membrane filtration	-0.3							
037	32	5.66	membrane filtration	0.1				52	7.21	membrane filtration	0.9
038								Detected		CCFRA2.8.3:2003	
039	76	8.72	membrane filtration	2.1				60	7.75	membrane filtration	1.3
040	29	5.39	AS/NZS 4276.17.1:2000	-0.1	29	5.39	AS/NZS 4276.17.1:2000	29	5.39	AS/NZS 4276.17.1:2000	-0.3
042	16	4.00	membrane filtration	-1.0							
044	24	4.90	membrane filtration	-0.4	24	4.90	membrane filtration	24	4.90	membrane filtration	-0.6
046											
047	26	5.10	Membrane Filtration	-0.3				34	5.83	Membrane Filtration	0.0

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5
 where no assigned value or z-scores issued, see Section 4.1

SQRT - square root

Table 6: Organism Identification

laboratory number	target organism: <i>Serratia marcescens</i>	
	result	assessment
001	<i>Serratia marcescens</i>	S
002	<i>Serratia marcescens</i>	S
004	<i>Serratia marcescens</i>	S
008	<i>serratia marcescens</i>	S

S = satisfactory

NS = not satisfactory

Table 7: Participants' Comments

DW095m01

laboratory number	comments
038	The scope for us is Detection only.
046	THE METHOD WE USED WAS AOAC 991.15 (DEFINED SUBSTRATE-COLILERT)REPORTED IN MPN/100 mL

DW095m02

laboratory number	comments
034	Incubation temperature is at 35°C for 2 days.
047	Sample not dispatched with others (16.07.25). Received 04.08.25 after error was spotted and FAPAS informed.

DW095m03

laboratory number	comments
014	Enterococci Method : FM-MNC-41-00 (2009-08) Pseudomonas aeruginosa Method: FM-MNC-40-00 (2009-08)
024	Test for Clostridium perfringens only
036	Enterococci - ISO 7899-2: 2000(E) Pseudomonas aeruginosa - ISO 16266:2006(E) Clostridium perfringens - ISO 14189:2013(E)
037	sample arrive to the lab with temperature 30c.
044	TCVN 6189-2:2009 (ISO 7899-2:2000); ISO 14189:2013; TCVN 8881:2011 (ISO 16266:2006)
046	The method we used was Standard Methods 9213.G with deviations (DEFINED SUBSTRATE-PSEUDALERT)REPORTED IN MPN/100 mL

DW095m04

laboratory number	comments
004	Sanger Sequencing, Maldi TOF

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

Table 8: Assigned Values and Standard Deviations for Proficiency

DW095m01

organism	data points, <i>n</i>	assigned value, x_a SQRT cfu/100ml	uncertainty, <i>u</i>	standard deviation for proficiency, σ_p	
Total Coliforms	17	4.22	0.32	ffp	1.50
<i>Escherichia coli</i>	19	3.46	0.20	ffp	1.50

ffp = fitness-for-purpose criteria

SQRT - square root

DW095m02

organism	data points, <i>n</i>	assigned value, x_a SQRT cfu/ml	uncertainty, <i>u</i>	standard deviation for proficiency, σ_p	
Colony Counts (22°C/3 days)	6	9.48	0.43	ffp	1.25
Colony Counts (37°C/2 days)	10	9.80	0.18	ffp	1.25

ffp = fitness-for-purpose criteria

SQRT - square root

DW095m03

organism	data points, <i>n</i>	assigned value, x_a SQRT cfu/100ml	uncertainty, <i>u</i>	standard deviation for proficiency, σ_p	
Enterococci	19	7.54	0.14	ffp	1.25
<i>Pseudomonas aeruginosa</i>	19	4.61	0.18	ffp	1.50
<i>Clostridium perfringens</i>	10	5.52	0.37	ffp	1.50
<i>Clostridium</i> spp.	2	not set	n/a	ffp	n/a
Sulphite Reducing <i>Clostridia</i> (SRC)	11	5.83	0.36	ffp	1.50

ffp = fitness-for-purpose criteria

SQRT - square root

n/a - not applicable

Table 9: Number and Percentage of z-Scores where $|z| \leq 2$

DW095m01

organism	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Total Coliforms	15	17	88
<i>Escherichia coli</i>	20	20	100

DW095m02

organism	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Colony Counts (22°C/3 days)	5	6	83
Colony Counts (37°C/2 days)	8	10	80

DW095m03

organism	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Enterococci	18	19	95
<i>Pseudomonas aeruginosa</i>	19	19	100
<i>Clostridium perfringens</i>	9	10	90
<i>Clostridium</i> spp.	n/a	n/a	n/a
Sulphite Reducing Clostridia (SRC)	11	11	100

n/a - not applicable

Table 10: Number and Percentage of Satisfactory Assessments for Organism Identification

DW095m04

examination	intended result	number of satisfactory results	total number of results	% satisfactory results
organism identification	<i>Serratia marcescens</i>	4	4	100

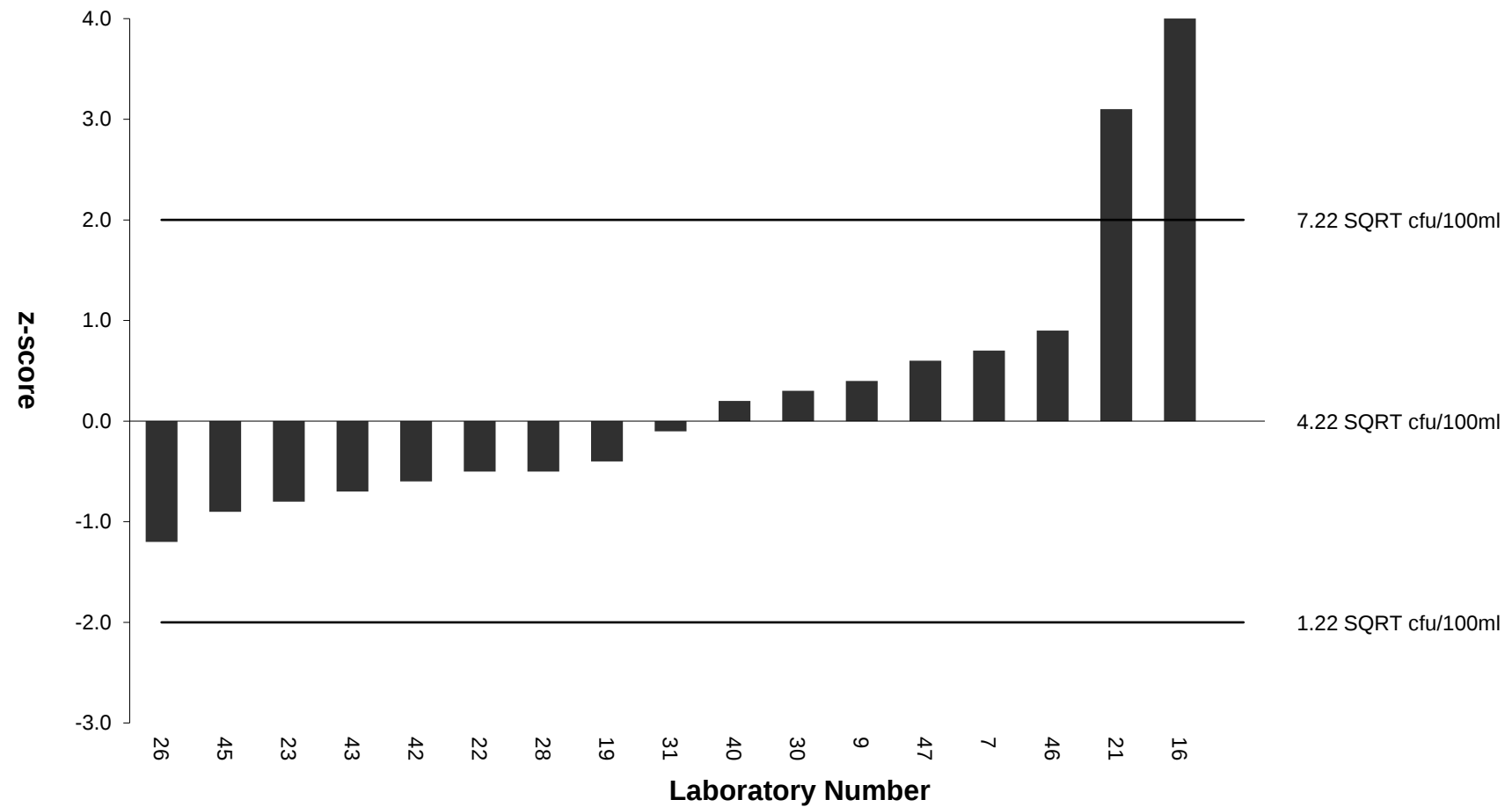


Figure 1: z-Scores for Enumeration of Total Coliforms

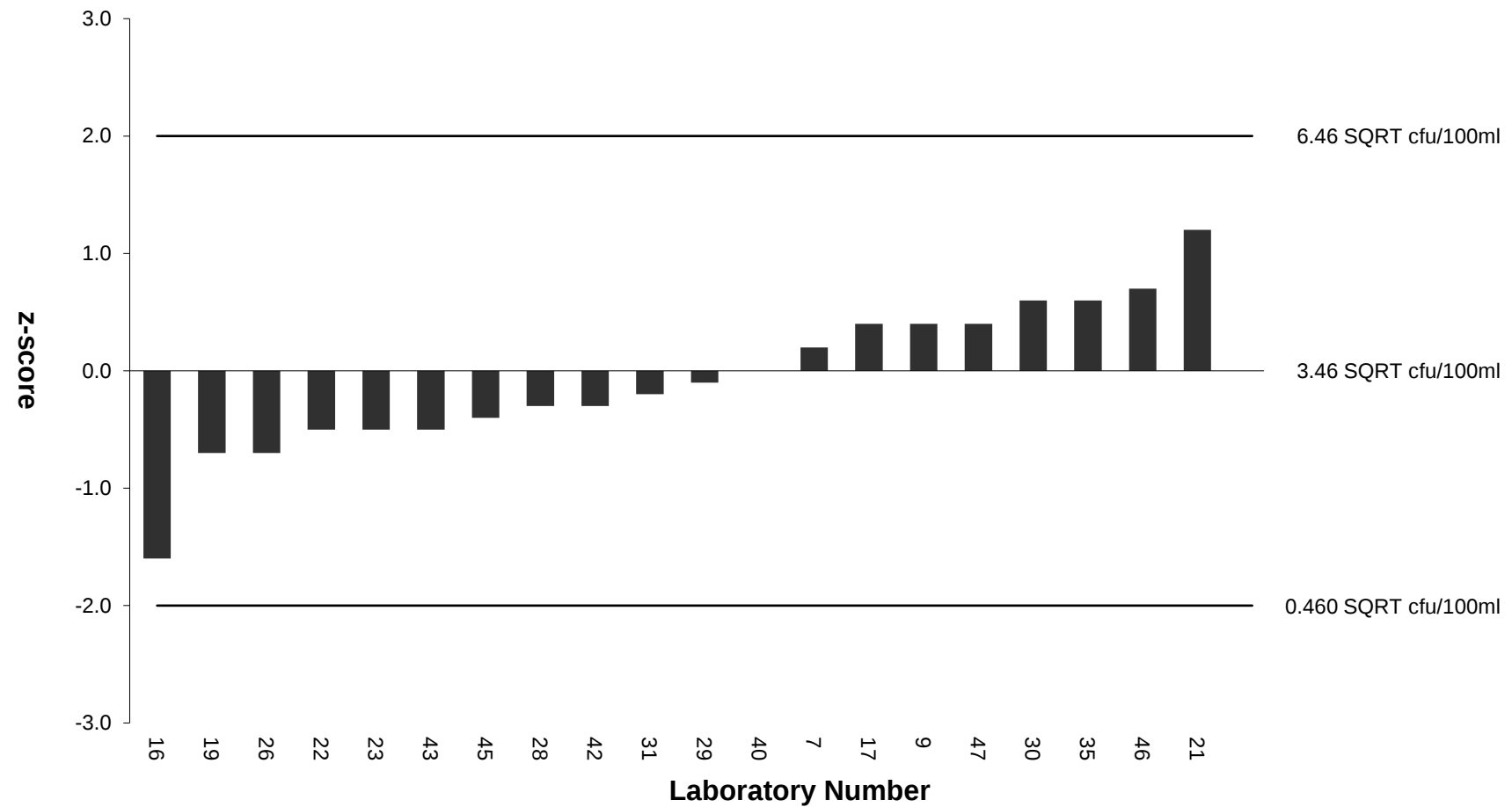


Figure 2: z-Scores for Enumeration of *Escherichia coli*

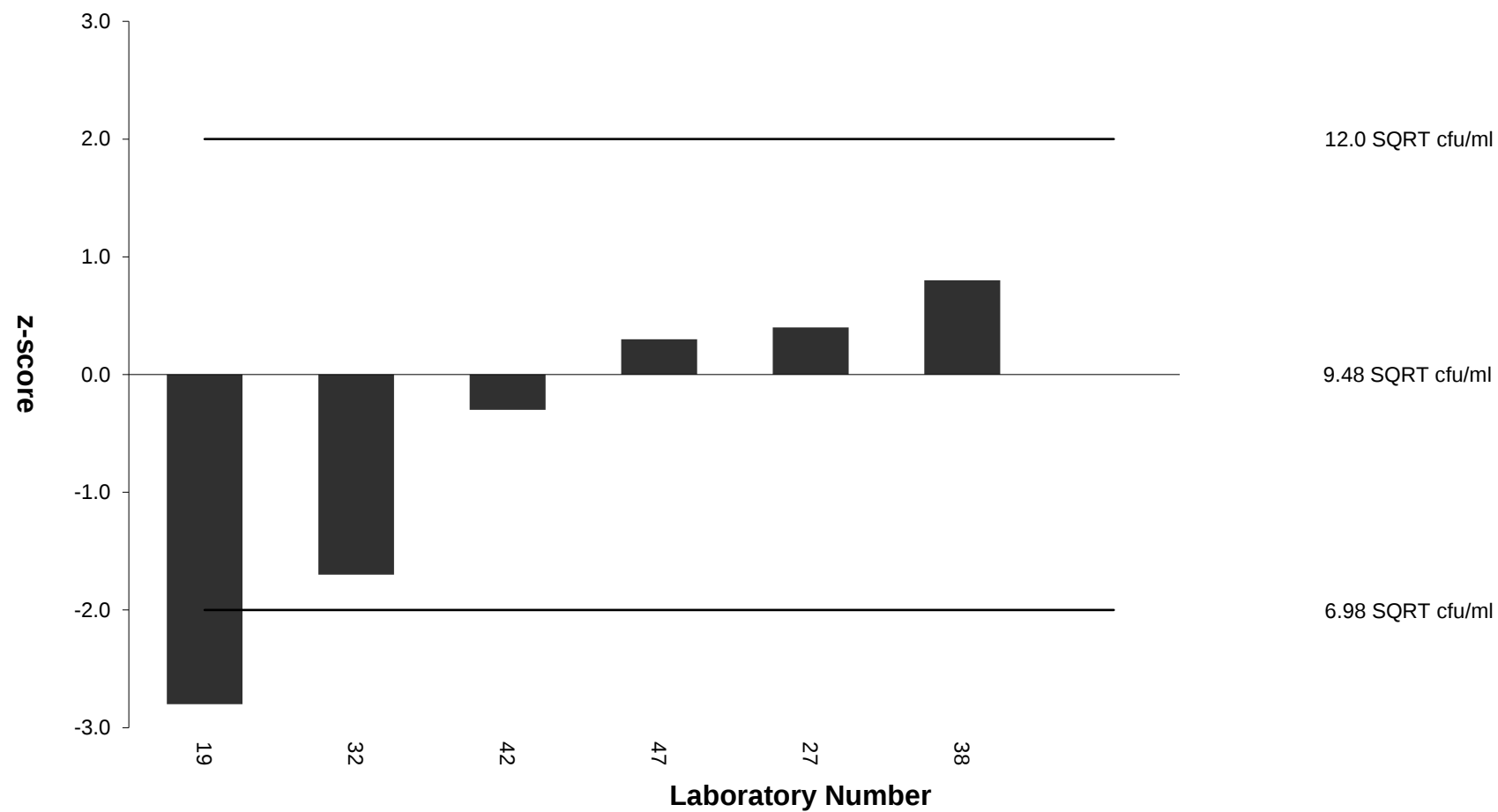


Figure 3: z-Scores for Colony Count after 3 days at 22°C

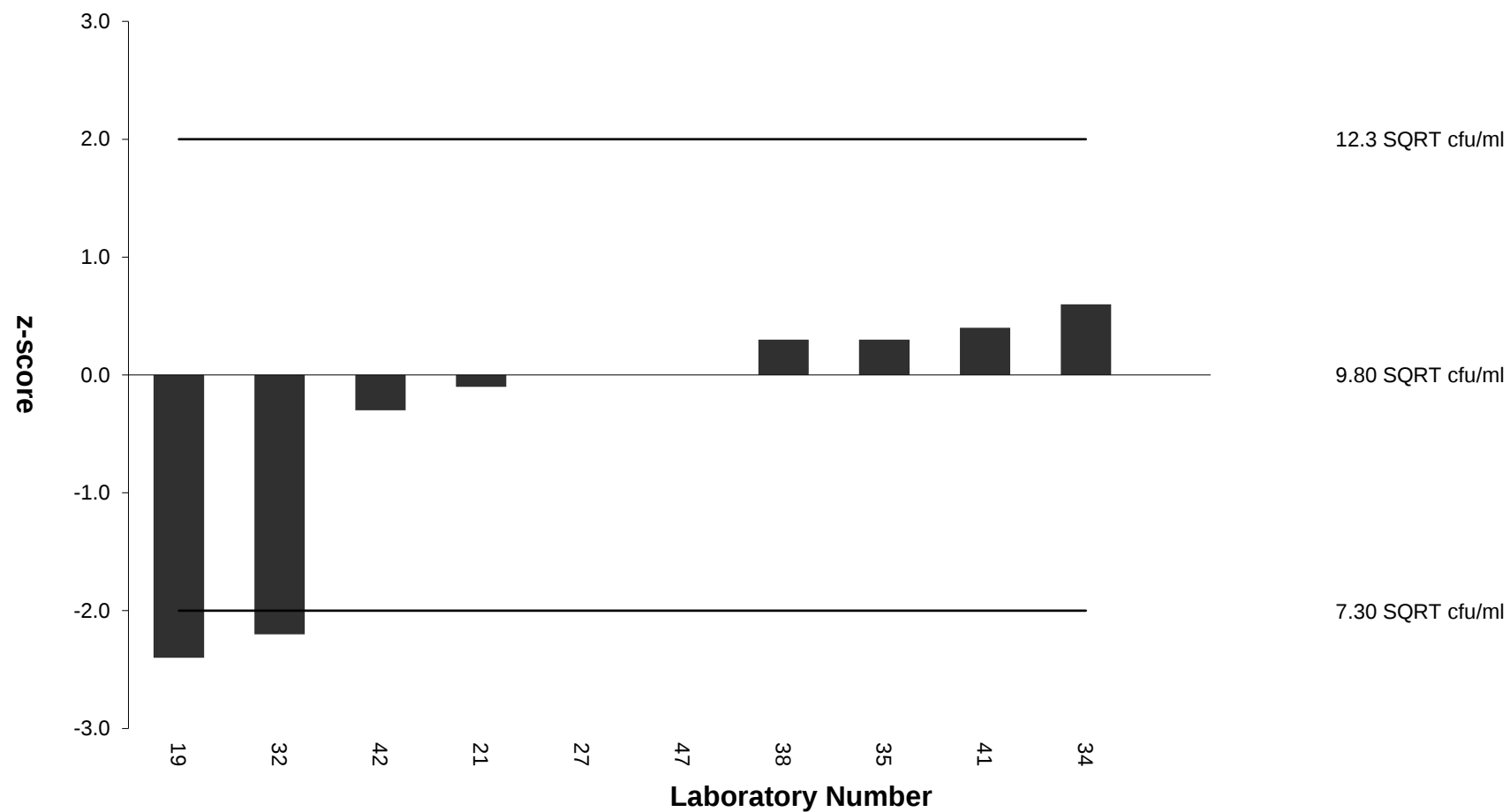


Figure 4: z-Scores for Colony Count after 2 days at 37°C

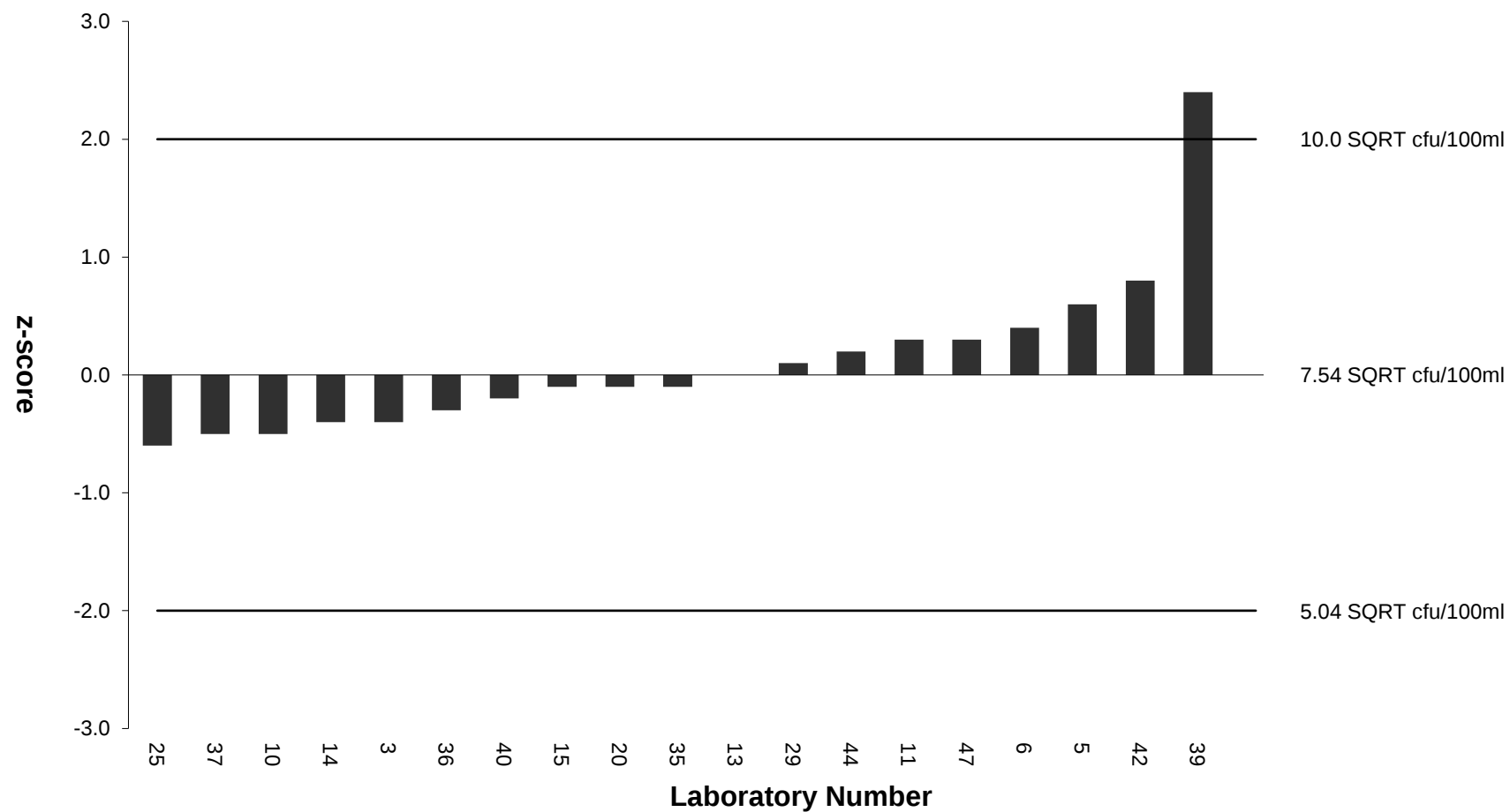


Figure 5: z-Scores for Enumeration of Enterococci

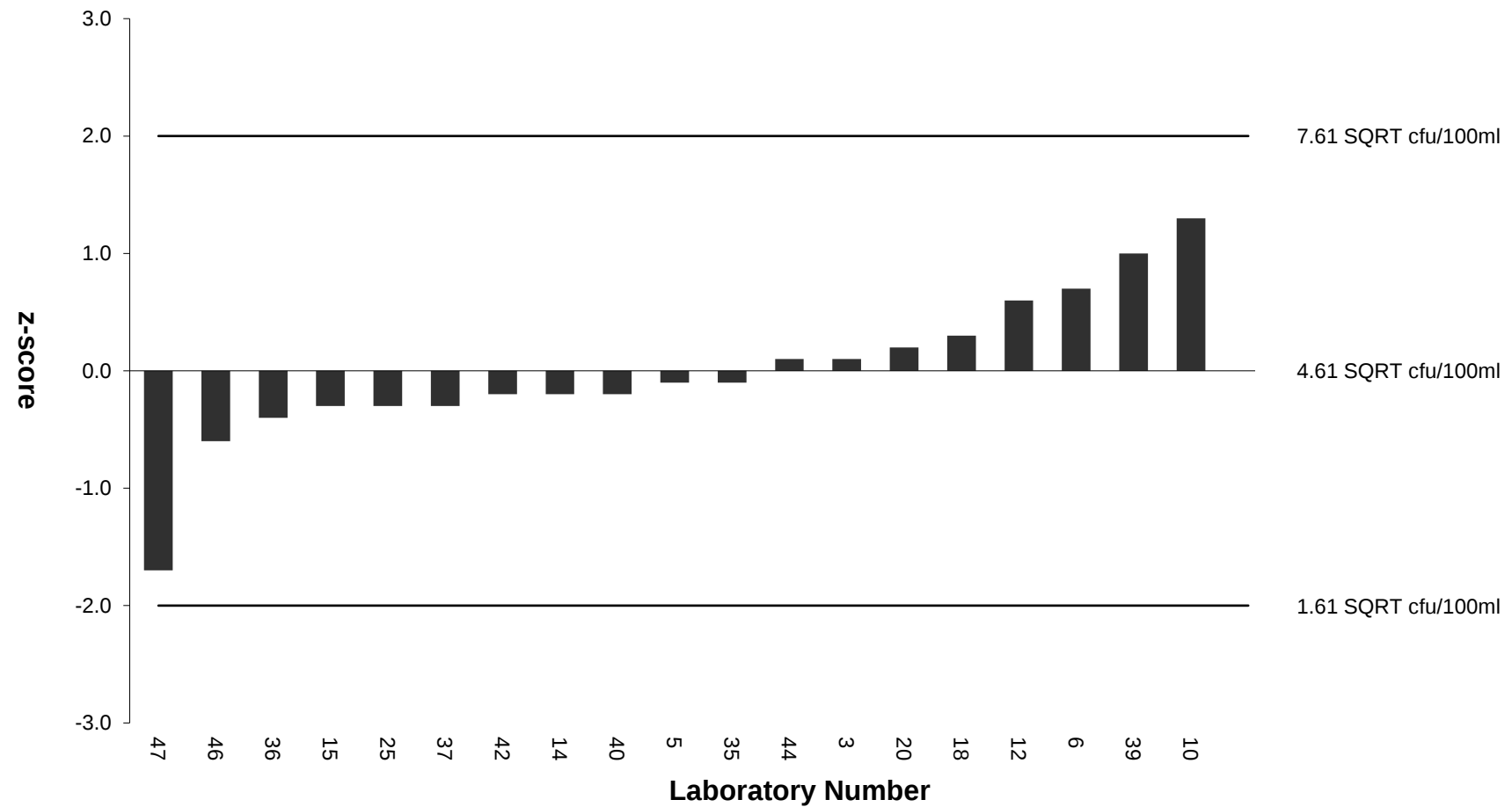


Figure 6: z-Scores for Enumeration of *Pseudomonas aeruginosa*

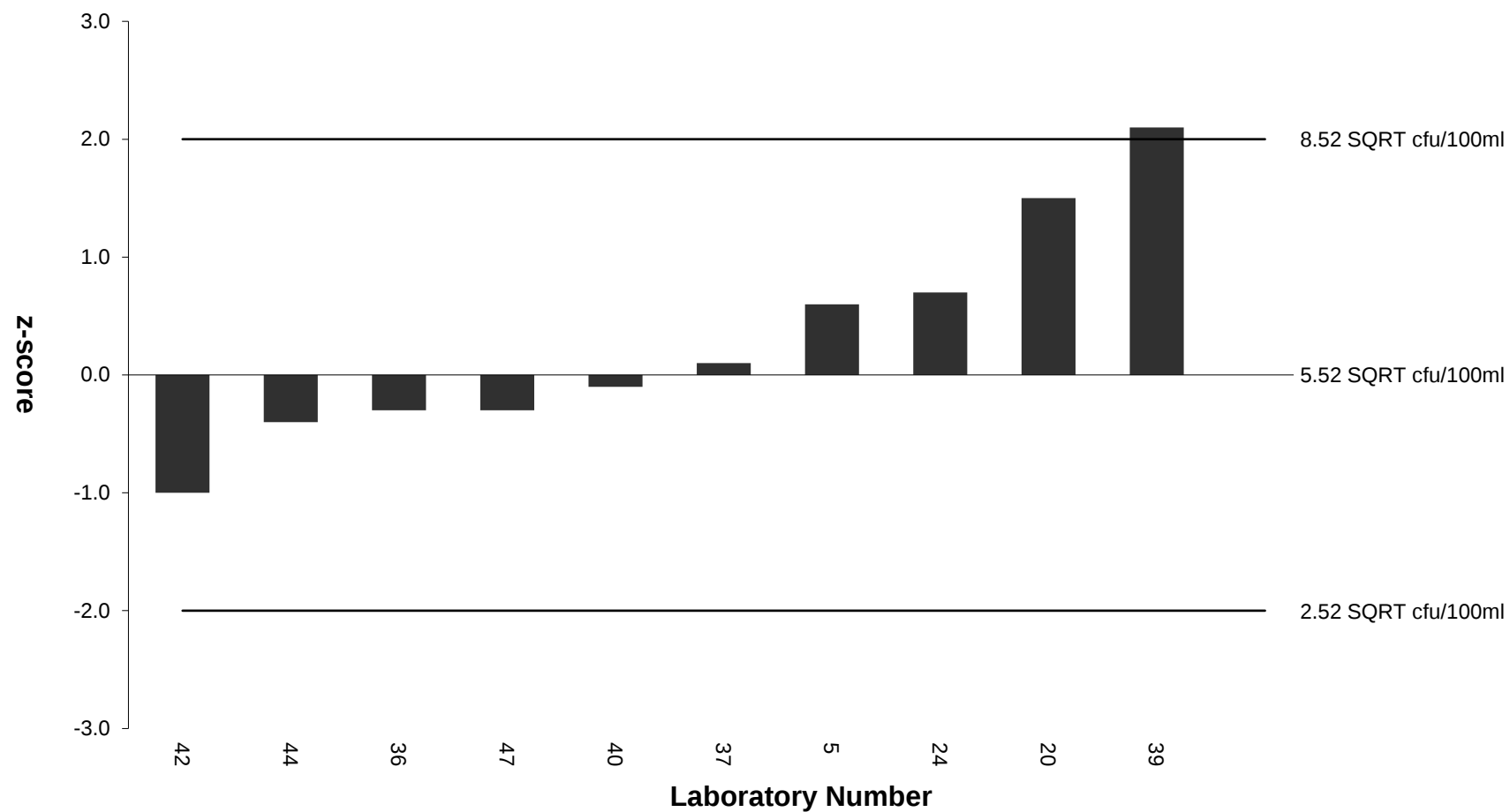


Figure 7: z-Scores for Enumeration of *Clostridium perfringens*

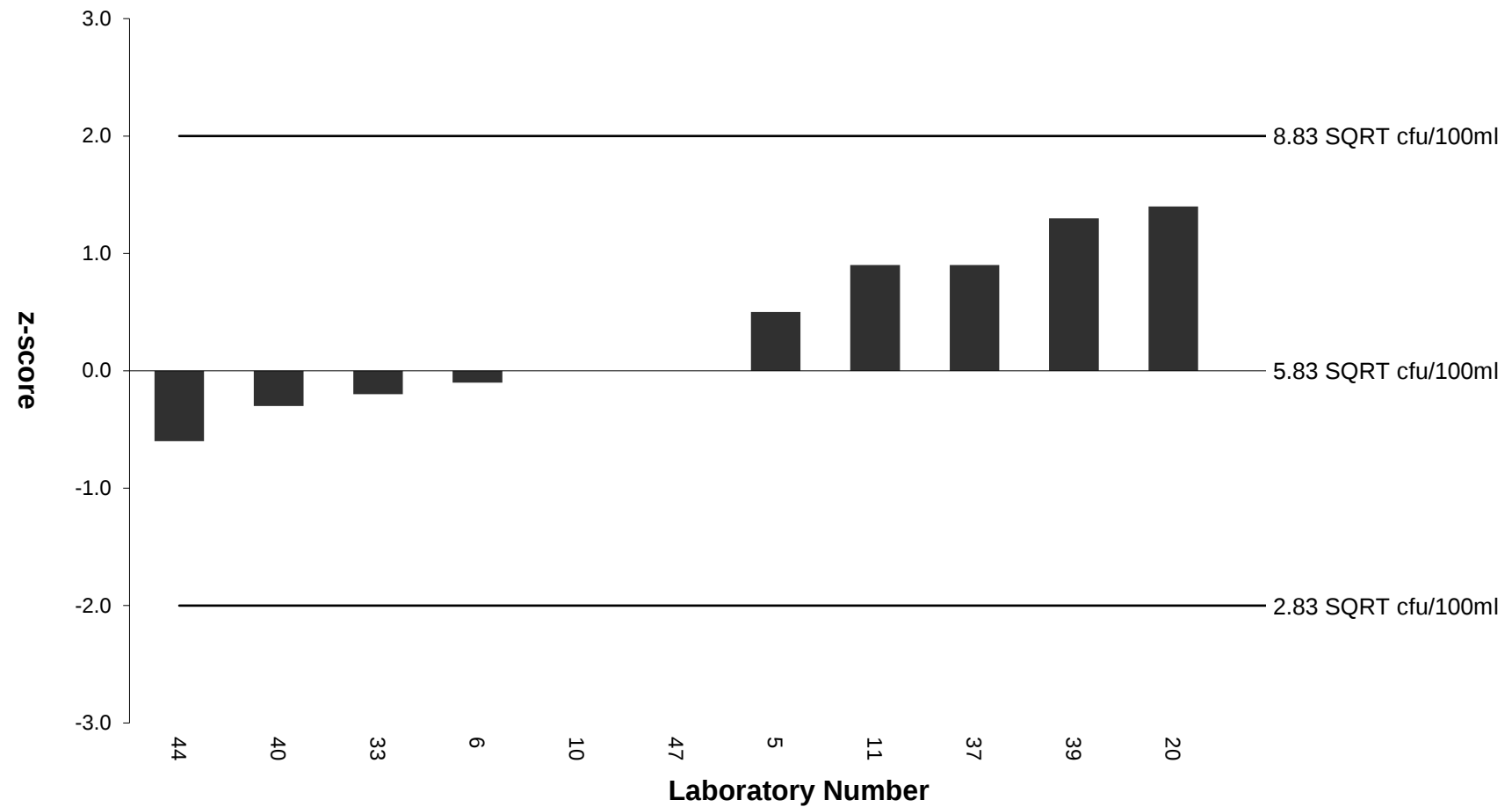


Figure 8: z-Scores for Enumeration of Sulphite Reducing Clostridia (SRC)

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

Is the Method Used Accredited?	laboratory number
no	021 026 031
yes	007 009 019 022 023 030 038 040 042 046 047

Which National or International Standard (ISO) laboratory number

ISO 9308-1:2014 (membrane filtration)	007 019 022 030 031 042
SCA MoDW (2009) - Part 4	047
AOAC 991.15	046
APHA	040
APHA SM 9221	009
SNI 3354:2015	026
Standard Methods For the Examination of Water and Waste Water. 24th Ed	021
United States Environmental Protection Agency. Method 1604: Total Coliforms and Escherichia coli in Water by Membrane Filtration Using a Simultaneous Detection Technique	023

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

AOAC 991.15	046
APHA 9222 B	040
APHA SM 9221	009
APHA9221 B&D	038
ISO 9308-1:2014	026
SM 9221	021
United States Environmental Protection Agency. Method 1604: Total Coliforms and Escherichia coli in Water by Membrane Filtration Using a Simultaneous Detection Technique	023

Method (	laboratory number
membrane filtration	007 019 022 023 026 030 031 040 042 047
multiple tube (MPN - most probable number)	009 021
COLILERT	046

Media	laboratory number
Membrane Lactose Glucoronide Agar (MLGA)	040 047
Membrane Lauryl Sulphate Broth (MLSB)	038
Chromogenic Coliform Agar (CCA)	007 019 022 023 026 030 042
CROMOCULT MERCK	031
Lauryl sulphate Broth MPN	021

Incubation Time (hours) / Incubation Temperature (°C)	laboratory number
4/30 then 14/37	038 042 047
22/36°C	007
24/35	026 040 046
24/36	023 030
24/36°C	031
24/37	019
48/35	021

Did you confirm the identity of the colonies grown?	laboratory number
no	019 021 038 046
yes	007 009 023 026 030 031 040 042 047

Number of colonies used for confirmation	laboratory number
10	007 030 031 047
2	040
4	009
6	026
9	023

Confirmation Tests	laboratory number
Oxidase	007 026 030 031 042 047
Lactose fermentation	009 047
colonies colour	023
LT Broth & EC Broth	040

Confirmation (Selective Media)	laboratory number
Brilliant Green Bile Broth (BGBB)	021 038
Lactose Peptone Water	047
Tryptone Nutrient Agar	030 031
Chromocult Coliform Agar (CCA)	023
NA-MUG Agar	040

Escherichia coli

Is the Method Used Accredited?	laboratory number
no	021 026 031
yes	007 009 017 019 023 029 030 035 038 040 042 046 047

Which National or International Standard (ISO)	laboratory number
ISO 9308-1:2014 (membrane filtration)	007 019 030 031 035 042
SCA MoDW (2009) - Part 4	047
AOAC 991.15	046
APHA	040
SCA MoREW (2016) Part 3	029
SMEWW 9222I:2023	017
SNI 3354:2015	026
Standard Methods For the Examination of Water and Waste Water. 24th Ed	021
United States Environmental Protection Agency. Method 1604: Total Coliforms and Escherichia coli in Water by Membrane Filtration Using a Simultaneous Detection Technique	023

If the method is not an ISO Standard, state a reference for the method.	laboratory number
AOAC 991.15	046
APHA 9222 G	040
APHA SM 9221	009
APHA9221E &F	038
ISO 9308-1:2014	026
SM 9221	021
United States Environmental Protection Agency. Method 1604: Total Coliforms and Escherichia coli in Water by Membrane Filtration Using a Simultaneous Detection Technique	023

Method	laboratory number
membrane filtration	007 017 019 023 026 029 030 031 035 040 042 047
multiple tube (MPN - most probable number)	009 021
COLILERT	046

Media	laboratory number
Membrane Lactose Glucoronide Agar (MLGA)	029 038 047
Chromogenic Coliform Agar (CCA)	007 019 023 026 030 035 042
CROMOCULT MERCK	031
Lauryl sulphate broth	021
m-endo Agar	040

Incubation Time (hours) / Incubation Temperature (°C)	laboratory number
4/30 then 14/37	038 042 047
4/30 then 14/44	029
18-24h 37°C	035
22/36°C	007
24/35	026 040 046
24/36	023 030
24/36°C	031
24hours/36	017
48/35	021
48/37	019

Did you confirm the identity of the colonies grown?	laboratory number
no	007 019 021 029 035 046
yes	009 017 023 026 030 031 040 047

Number of colonies used for confirmation	laboratory number
10	031 047
2	040
4	009
5	030
6	026
7	023
Eyes	017

Confirmation Tests	laboratory number
Oxidase	026 031
Indole	023 038 047
beta-Galactosidase	030
Lactose fermentation	047

Confirmation (Selective Media)**laboratory number**

TBX	009 030
Tryptone Nutrient Agar	031
Chromocult Coliform Agar (CCA)	023
EC MUG	021
M-endo	017
NA-MUG Agar	040
Tryptone Water	038 047

Colony Counts (22°C/3 days)**Is the Method Used Accredited?****laboratory number**

yes	019 027 032 038 042 047
-----	-------------------------

Which National or International Standard (ISO)**laboratory number**

ISO 6222:1999	019 027 032 042
SCA MoDW (2012) - Part 7	047

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

CCFRA1.1.4:2003	038
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Method**laboratory number**

Pour plate	019 027 032 038 042 047
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Media**laboratory number**

Plate Count Agar (PCA)	042
Yeast Extract Agar (YEA)	019 027 038 047
Nutrient agar	032

Colony Counts (37°C/2 days)

Is the Method Used Accredited?

no

laboratory number

021

yes

019 027 032 034 035 038 041 042 047

Which National or International Standard (ISO)

ISO 6222:1999

019 027 032 035 042

SCA MoDW (2012) - Part 7

047

APHA 9215 (2017)

034

ML-TR -SOP-027

041

Standard Methods For the Examination of Water and Waste Water. 24th Ed

021

If the method is not an ISO Standard, state a reference for the method.

laboratory number

CCFRA1.1.4:2003

038

ML-TR -SOP-027

041

SM 9215 B

021

Method

laboratory number

Pour plate

019 021 027 032 034 035 038 042 047

Filtration

041

Media

laboratory number

Plate Count Agar (PCA)

021 042

Yeast Extract Agar (YEA)

019 027 035 038 047

R2A Agar

034

Nutrient agar

032

TGE

041

Enterococci

Is the Method Used Accredited?	laboratory number
no	003 010
yes	005 011 013 014 015 020 025 029 035 036 038 039 040 042 044 047

Which National or International Standard (ISO) does the Ents method follow?

ISO 7899-2:2000	005 013 015 035 036 039 042 044
SCA MoDW (2012) - Part 5	047
APHA	040
APHA 9230	020
CCFRA and APHA	038
compactdry	003
FM-MNC	014
PN-EN ISO 7899-2:2004	011
SCA MoREW (2015) Part 4	029

If the method is not an ISO Standard, state a reference for the method.

APHA 9230 C	040
APHA 9230 C 24th Edition, 2023	010
APHA 9230C	003
CCFRA and APHA	038
FM-MNC-41-00 (2009-08)	014

Method	laboratory number
membrane filtration	003 005 010 011 013 014 015 020 029 035 036 039 040 042 044 047
Enterolert	038

Media	laboratory number
KF Streptococcus Agar	014
Slanetz and Bartley Agar	005 011 015 029 036 039 042 047
CEA	035
Chromocult Enterococci Agar	020
compactdry ETC	003
m-enterococcus Agar	040
M-Enterococcus Agar Base, modified then EIA medium	010

Incubation Time (hours) / Incubation Temperature (°C)	laboratory number
44/37	005 036 042
48/37	011 014 015 020 039 047
4/37 then 40/44	029
24/35	003
24/44	035
48/41	040
48/41.5 then 0.33/41.5	010

Did you confirm the identity of the colonies grown?	laboratory number
no	003 020 035 038
yes	005 010 011 014 015 029 036 039 040 042 047

Number of colonies used for confirmation	laboratory number
1	040
10	010 047
110	039
4	014
5	015
59	029
62	011
all	005

Confirmation Tests	laboratory number
Aesculin hydrolysis by sub-culture	015 047
Aesculin hydrolysis by membrane transfer	005 010 029 036 039
Salt tolerance	010
hydroliza eskuliny	011
Muldituff	014
Vitek 2 Compact	040

Pseudomonas aeruginosa

Is the Method Used Accredited?	laboratory number
no	010 012 046
yes	003 005 014 015 020 025 035 036 038 039 040 042 044 047

Which National or International Standard (ISO)	laboratory number
ISO 16266:2006	003 005 015 035 036 039 042 044
SCA MoDW (2010) - Part 8	047
APHA	040
FM-MNC	014
ISO 16266-2:2018	012
Standard Methods 9213.G with deviations	046

If the method is not an ISO Standard, state a reference for the method.	laboratory number
APHA	020
APHA 9213 E	040
APHA 9213 E 24th Edition, 2023	010
CCFRA and APHA	038
FM-MNC-40-00 (2009-08)	014
Standard Methods 9213.G with deviations	046

Method	laboratory number
membrane filtration	003 005 010 014 015 020 035 036 039 040 042 044
Pseudalert	012 038 047
Standard Methods 9213.G with deviations	046
Media	laboratory number
Pseudomonas Agar with CFC supplement	038
Pseudomonas Agar with CN supplement	005 015 035 036 039 042
Cetrimide Agar	014 020
compactdry	003
M-PA Agar	010 040
Pseudalert	012 047
Incubation Time (hours) / Incubation Temperature (°C) (Pseuds)	laboratory number
20/30	038
48/37	003 005 014 015 020 035 036 039 042
24/35	046
24/38	012 047
72/41	040
72/41.5	010
Did you confirm the identity of the colonies grown?	laboratory number
no	003 020 038 046 047
yes	005 010 012 014 015 035 036 039 040 042
Number of colonies used for confirmation	laboratory number
1	035 040
10	010 039
4	014
5	015
all	005

Which test(s) did you use to confirm identity? laboratory number

Oxidase	005 015 036 039
Milk Agar	010
Muldi tuff	014
PCR, UV	035
Vitek 2 Compact	040

Clostridium perfringens

Is the Method Used Accredited? laboratory number

no	047
yes	005 020 024 036 039 040 042 044

Which National or International Standard (ISO) laboratory number

ISO 14189:2013 (membrane filtration)	005 036 039 042 044
SCA MoDW (2010) - Part 6	020 047
AS/NZS	040
W5, Wales Health Protection Agency Standard Method, 2005	024

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

AS/NZS 4276.17.1:2000	040
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Method laboratory number

anaerobic jar	020 039 040 042
membrane filtration	005 036 044 047
membrane filtration & anaerobic jar	024

Media	laboratory number
Tryptose Sulphite Cycloserine Agar (TSC) with egg	040
Tryptose Sulphite Cycloserine Agar (TSC) without egg	005 036 042 047
Tryptose Cycloserine Agar	020 024 039

Incubation Time (hours) / Incubation Temperature (°C) (Clost.)	laboratory number
21/37	039
21/44	005 020 036 042 047
24/44	024
48/37	040

Did you confirm the identity of the colonies grown?	laboratory number
no	020
yes	005 024 036 039 040 042 047

Number of colonies used for confirmation	laboratory number
1	040
10	036 039 047
1-2 colonies	024
all	005

Which test(s) did you use to confirm identity?	laboratory number
Nitrate/nitrite reduction	024
Motility	024
Lactose fermentation	024
Gelatin liquifaction	024
acid phosphatase reaction	005 036 039 042 047
Vitek 2 Compact	040

Method	laboratory number
by smearing colony on pre-soaked filter paper	005 036 039
Crossley Milk	047

***Clostridium* spp.**

Is the Method Used Accredited?	laboratory number
yes	040 044

Which National or International Standard (ISO)	laboratory number
ISO 14189:2013 (membrane filtration)	044
AS/NZS	040

If the method is not an ISO Standard, state a reference for the method.	laboratory number
AS/NZS 4276.17.1:2000	040

Method used	laboratory number
anaerobic jar	040
membrane filtration	044

Traditional Plating: media used	laboratory number
Tryptose Sulphite Cycloserine Agar (TSC) with egg	040

Incubation Time (hours)	laboratory number
48	040

Incubation Temperature (°C)

37

laboratory number

040

Sulphite Reducing Clostridia (SRC)**Is the Method Used Accredited?**

no

laboratory number

010 047

yes

005 011 020 033 038 039 040 044

Which National or International Standard (ISO)

ISO 6461-2:1986 (membrane filtration)

005 010 033

ISO 14189:2013 (membrane filtration)

044

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020 047

AS/NZS

040

ISO 14189: 2013

039

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

AS/NZS 4276.17.1:2000

040

CCFRA and APHA

038

PN-EN 26461-2:2001

005

PN-EN 26461-2:2001 z wyłączeniem pkt. 9.2

011

Method used**laboratory number**

anaerobic jar

038 039

cabinet

020

membrane filtration

005 010 011 033 040 044 047

Traditional Plating: media used	laboratory number
Tryptose Sulphite Cycloserine Agar (TSC) with egg	033 040
Tryptose Sulphite Cycloserine Agar (TSC) without egg	047
Sulfite Iron Tryptose Sulfite (TS)	005
Tryptose Cycloserine Agar	020
Iron Sulphite Agar (Modified)	010 039
Agar TSC	011

Incubation Time (hours)	laboratory number
24	020 047
48	005 010 011 033 039 040

Incubation Temperature (°C)	laboratory number
37	005 010 011 020 038 039 040 047
35	033

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 Elaine Leach (Round Coordinator). Participants with any comments or concerns about this proficiency test should contact:

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