



Fapas® – Food Microbiology Proficiency Test Report M314e09

Aerobic Plate Count in Chicken

December 2025

PARTICIPANT LABORATORY NUMBER

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This report is the output of a Management System that is certified by LRQA to ISO 9001:2015 [5, 6].

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SUMMARY

1. This proficiency test was dispatched with Food Microbiology Distribution 314. Reports for the other proficiency tests in this distribution are available separately.
2. The test material for Fapas[®] – Food Microbiology proficiency test M314e09 was dispatched in December 2025. Each participant received a chicken test material for an aerobic plate count.
3. An assigned value (x_a) was determined for the aerobic plate count and in conjunction with the standard deviation for proficiency (σ_p) was used to calculate a z-score for each result.
4. Results and assessments for the proficiency tests in enumeration are summarised as follows:

enumeration test	assigned value, x_a $\log_{10}$ cfu/g	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Aerobic Plate Count	4.80	26	30	87

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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® – Food Microbiology 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].

Fapas® – Food Microbiology test materials include background flora to simulate real conditions. Information for these organisms is given in APPENDIX I.

The test materials were stored at $+4\pm 2.5^{\circ}\text{C}$ until dispatch.

2.2. Homogeneity and Validation

For each proficiency test in enumeration, 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.

Fapas® proficiency test materials are prepared such that they are guaranteed to be sufficiently stable within nine (9) days of the date of dispatch shown on the programme. Our samples are known to be stable for much longer than this but for stability to be guaranteed we recommend that testing is started within this time frame. No further specific stability testing was required for this proficiency test. For proficiency tests where quality control samples are available for sale, additional testing has proven stability for this matrix/organism combination for an extended timeframe.

2.3. Dispatch

The start date was 01 December 2025. Test materials were sent to 31 participants.

2.4. Storage and Preparation Instructions

Instructions regarding sample storage and preparation were made available on the Fapas® website [9].

Participants are reminded that it is crucial to the outcome of the proficiency tests that the instructions for the preparation of the test materials are followed exactly.

3. RESULTS

The instructions for reporting results were as follows:

- Start the analysis between 01 and 10 December 2025.
- The results for enumeration tests must be reported as cfu/g.

Results were submitted by 30 participants (97%) before the closing date for this test, 29 December 2025.

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

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

4. STATISTICAL EVALUATION OF RESULTS

The results submitted by participants were statistically analysed in order to provide an assigned value for the aerobic plate count. The assigned value was then used in combination with the standard deviation for proficiency, σ_p , to calculate a z-score [10] 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 [11].

4.1. Calculation of the Assigned Value, x_a

The assigned value, x_a , for the aerobic plate count 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 or results reported as zero,
- ii) a $\log_{10}$ 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).

This procedure was straightforward and the robust mean was chosen as the assigned value.

The assigned value, together with its uncertainty is shown in Table 2.

4.2. Standard Deviation for Proficiency, σ_p

The standard deviation for proficiency, σ_p , was set at a value that reflects fitness-for-purpose for the analyses in question. The appropriate members of the Fapas[®] Advisory Committee have agreed this value corresponds to 0.25 $\log_{10}$ cfu/g.

The value for σ_p used to calculate z-scores from the reported results of this test are given in Table 2.

4.3. Individual z-Scores

Participants' z-scores were calculated as:

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

where x = the participant's reported result expressed as $\log_{10}$,

x_a = the assigned value, see Table 2,

and σ_p = the standard deviation for proficiency, see Table 2.

Participants' z-scores for the aerobic plate count are given in Table 1 and shown a histogram in Figure 1. 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 2.

The number and percentage of z-scores in the range $-2 \leq z \leq 2$ for the aerobic plate count are given in Table 3.

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 [11].

6. REFERENCES

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<https://fapas.com/technical-documentation>, accessed 28/01/2025.
- 10 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.
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Table 1: Results and z-Scores

laboratory number	enumeration test		
	Aerobic Plate Count assigned value: 4.80 log ₁₀ cfu/g		
	result	log ₁₀	z-score
002	6.0E+4	4.8	-0.1
006	8.8E+4	4.9	0.6
009	54000	4.7	-0.3
012	2.2E+4	4.3	-1.8
013	2.6E+4	4.4	-1.5
019	8.2E4	4.9	0.5
041	1.1E+5	5.0	1.0
044	1.1E+5	5.0	1.0
048	68000	4.8	0.1
049	93E+3	5.0	0.7
050	6.0E+4	4.8	-0.1
052	8.2E+4	4.9	0.5
063	57000	4.8	-0.2
082	8.2E+4	4.9	0.5
083	1.1E+5	5.0	1.0

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

* samples analysed outside of the recommended time frame

Table 1 (continued): Results and z-Scores

laboratory number	enumeration test		
	Aerobic Plate Count assigned value: 4.80 log ₁₀ cfu/g		
	result	log ₁₀	z-score
087	9.45E+4	5.0	0.7
114	1.2E+5	5.1	1.1
115	1573333 *	6.2	5.6
124	7900 *	3.9	-3.6
154	1.1E+5	5.0	1.0
156	23000	4.4	-1.7
157	2.0E+4	4.3	-2.0
166	73000	4.9	0.3
184	6.8E+3 *	3.8	-3.9
190	5.0E+4 *	4.7	-0.4
208	1.5E+5	5.2	1.5
218	4.1E+4 *	4.6	-0.7
219	2.6E+4 *	4.4	-1.5
220	4.5E+4	4.7	-0.6
227	3.5E+8 *	8.5	15.0

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

* samples analysed outside of the recommended time frame

Table 2: Assigned Values and Standard Deviations for Proficiency

enumeration test	data points, n	assigned value, x_a $\log_{10}$ cfu/g	uncertainty, u	standard deviation for proficiency, σ_p
Aerobic Plate Count in Chicken	26	4.80	0.05	ffp 0.25

ffp = fitness-for-purpose criteria

Table 3: Number and Percentage of z-Scores where $|z| \leq 2$

enumeration test	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Aerobic Plate Count	26	30	87

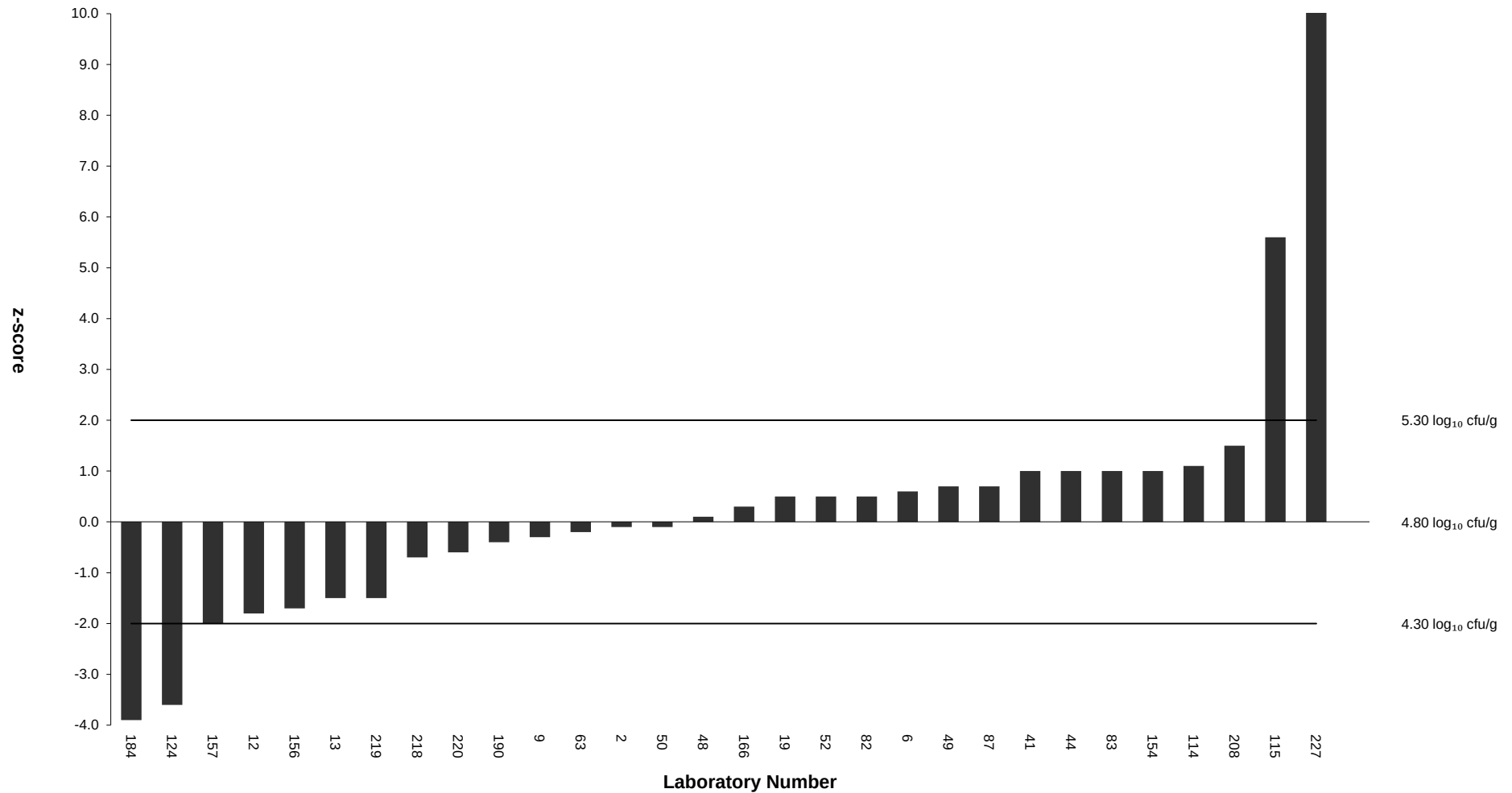


Figure 1: z-Scores for Aerobic Plate Count

**APPENDIX I: Organisms present in Fapas® – Food Microbiology
Test Materials**

proficiency test	matrix	target organism	background flora
aerobic plate count	chicken	<i>Lactiplantibacillus plantarum</i> <i>Kocuria rhizophila</i> <i>Staphylococcus aureus</i>	n/a
n/a not applicable			

APPENDIX II: 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.

Aerobic Plate Count

Accredited Method Used	laboratory number
no	012 013 019 082 166 190 208 227
yes	002 006 009 041 048 049 050 052 063 083 087 114 115 124 154 156 157 184

Method Based on an International Standard	laboratory number
no	012 013
yes	002 006 009 019 041 048 049 050 052 063 082 083 087 114 115 124 154 156 157 166 184 190 208

Which Initial Suspension/Diluent Used	laboratory number
Buffered Peptone Water (BPW)	002 009 019 041 048 049 050 052 063 083 087 114 124 156 157 166 190 208 227
Butterfield's Phosphate Buffer	006
Maximum Recovery Diluent (MRD)	082 154
Peptone Water	184
0.85% sterile physiological saline solution	013
Sterile Saline (0.85%)	012
Sterile saline solution	115

Plating Method Used	laboratory number
Pour plate	002 006 009 019 048 049 050 052 063 082 087 114 154 157 184 208 227
Spread plate	083 190
Overlay	041
Petrifilm (3M)	012 013 115 124 156 166

Inoculum Volume (ml)	laboratory number
0.1	083 190
1.0	002 006 009 012 013 019 041 048 049 050 052 063 082 087 114 115 124 154 156 157 166 184 208 227

Which Selective/Chromogenic Medium Used	laboratory number
Petrifilm (3M) Aerobic Plate Count	012 013 049 115 124 156 166
Plate Count Agar (PCA)	002 006 009 019 048 052 063 082 083 087 114 154 157 184 190 208 227
Compact dry	041

Incubation Temperature (°C)	laboratory number
30	041 048 052 063 082 083 087 114 184 190 208
35	006 012 019 049 157 166
37	002 009 013 050 115 124 154 156 227

Time Incubated (hours) Approximately	laboratory number
24	157
48	002 006 009 012 013 019 041 049 050 115 124 154 156 166 227
72	048 052 063 082 083 087 114 184 190 208

APPENDIX III: 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® – Food Microbiology proficiency tests.

2. PROTOCOL

The Protocols [7, 8] set out how Fapas® – Food Microbiology 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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