INŠTITUT ZA MLEKARSTVO IN PROBIOTIKE
INSTITUTE OF DAIRY SCIENCE & PROBIOTICS

PROFICIENCY TESTING

Total bacterial count – Instrumental method IBC/ml

MARCH

2024

Dear Sir/Madam!

Thank you for participating in the proficiency testing MARCH 2024. Participating in the proficiency testing will allow you to evaluate the performance of your work and obtain data for maintaining the quality system in your laboratory. Based on the independent results in this report, you can monitor, evaluate and ultimately improve your processes.

This report includes results of samples with serial number: 1068-0324 for parameter TOTAL BACTERIAL COUNT in milk with instrumental method (IBC/ml) and they are presented in the form of tables and graphs.

Table 1: Used statistics

$\boldsymbol{mean = \frac{\sum x_n}{N}}$	$mean$ = average sample value x_n = value of sample n N = number of samples
$\boldsymbol{diff = \bar{x}_n - REF}$	$diff$ = deviation of sample value from reference value $\bar{x}_n$ = avrage sample value REF = robust average sample value
$\boldsymbol{Z - value = \frac{\bar{x}_n - REF}{S}}$	$\bar{x}_n$ = average sample value REF = robust average sample value S = standard deviation of robust average sample value (*ref*)
	■ |Z| ≤ 2,00 satisfactory
	■ 2,00 < |Z| < 3,00 questionable
	■ |Z| ≥ 3,00 unsatisfactory
$\boldsymbol{d = \frac{\sum(\bar{x}_n - REF)}{N}}$	d = average of deviations x_n = value of sample n N = number of samples REF = robust average sample value
$\boldsymbol{Sd = \sqrt{\frac{\sum(\bar{x}_n - REF)^2}{N}}}$	Sd = standard deviation of deviations x_n = value of sample n N = number of samples REF = robust average sample value
$\boldsymbol{REF}$	Value REF represents robust average of each sample and it is calculated according ISO 13528 (Algorithm A) from results of all participating laboratories after excluding outliers according to Grubbs method (a=0,05)

Responsible for sample preparation and statistical analysis of results:
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Table 2: Outliers detection according to Grubbs method (a = 0,05)

	Sample					
Laboratory	1	2	3	4	5	n
1						10
2						0
3						0
4						0
5						0
6						0
7						0
8						0
9						0
10						0
n	0	0	0	0	10	

Legend:
n = number of outliers

Table 3: Repeatability (log IBC/ml)

	Sample (Sr)						
Laboratory	1	2	3	4	5	A	B
1	0,02	0,06	0,04	0,02	0,16	0,06	0,03
2	0,03	0,02	0,03	0,03	0,03	0,02	0,01
3	0,02	0,03	0,03	0,03	0,03	0,03	0,01
4	0,02	0,03	0,01	0,02	0,05	0,02	0,01
5	0,02	0,01	0,01	0,01	0,03	0,02	0,01
6	0,01	0,01	0,01	0,01	0,02	0,02	0,01
7	0,01	0,02	0,02	0,03	0,04	0,02	0,02
8	0,02	0,02	0,01	0,02	0,03	0,03	0,01
9	0,01	0,02	0,01	0,02	0,02	0,02	0,01
10	0,01	0,02	0,07	0,03	0,06	0,03	0,04

Legend:
Sr = Standard deviation of repetability (log IBC/ml)

Note:
Repeatability values for Bactocount instruments were calculated after recalculation of the returned results using a factor of 1,231197533 (IBC Bactocount / Bactoscan FC ratio).

Limits: according to the instructions of the instrument manufacturer

FOSS BactoScan FC+

Range (x1000 IBC/ml)	Sr (log IBC/ml)	Sample
10 – 50	0,07	5
51 – 200	0,05	2, A
> 200	0,04	1, 3, 4, B
Total range	0,05	

Bentley Bactocount IBC

Range (x 1000 IBC/ml)	Sr (log IBC/ml)	Sample
10 – 50	0,07	5
51 – 100	0,06	2
101 – 300	0,05	A
> 300	0,03	1, 3, 4

Table 4: Accuracy (log IBC/ml)

LAB 1	1	2	3	4	5	STD A	STD B
Mean	6,114	5,434	6,326	5,778	4,942	420	1657
REF	5,740	4,960	5,850	5,533	4,599		
diff (mean-REF)	0,374	0,474	0,475	0,244	0,343		
S	0,055	0,021	0,100	0,044	0,031		
Z-value	6,81	22,74	4,73	5,59	10,91		
REFCert						189 ± 10 %	517 ± 10 %
Mean×100/REFCert (%)						222	321

LAB 2	1	2	3	4	5	STD A	STD B
Mean	5,614	4,946	5,734	5,387	4,553	159	443
REF	5,740	4,960	5,850	5,533	4,599		
diff (mean-REF)	-0,126	-0,014	-0,116	-0,146	-0,046		
S	0,055	0,021	0,100	0,044	0,031		
Z-value	-2,30	-0,66	-1,16	-3,35	-1,47		
REFCert						154 ± 10 %	420 ± 10 %
Mean×100/REFCert (%)						103	105

LAB 3	1	2	3	4	5	STD A	STD B
Mean	5,659	4,887	5,683	5,512	4,609	176	379
REF	5,740	4,960	5,850	5,533	4,599		
diff (mean-REF)	-0,080	-0,073	-0,168	-0,021	0,009		
S	0,055	0,021	0,100	0,044	0,031		
Z-value	-1,46	-3,50	-1,67	-0,49	0,30		
REFCert						189 ± 10 %	517 ± 10 %
Mean×100/REFCert (%)						93	73

LAB 4	1	2	3	4	5	STD A	STD B
Mean	5,775	5,000	5,875	5,555	4,633	160	468
REF	5,740	4,960	5,850	5,533	4,599		
diff (mean-REF)	0,035	0,040	0,024	0,022	0,034		
S	0,055	0,021	0,100	0,044	0,031		
Z-value	0,64	1,92	0,24	0,50	1,08		
REFCert						154 ± 10 %	420 ± 10 %
Mean×100/REFCert (%)						104	111

LAB 5	1	2	3	4	5	STD A	STD B
Mean	5,734	4,959	5,811	5,488	4,556	149	426
REF	5,740	4,960	5,850	5,533	4,599		
diff (mean-REF)	-0,006	-0,001	-0,040	-0,045	-0,044		
S	0,055	0,021	0,100	0,044	0,031		
Z-value	-0,11	-0,03	-0,40	-1,03	-1,39		
REFCert						154 ± 10 %	420 ± 10 %
Mean×100/REFCert (%)						97	101

LAB 6	1	2	3	4	5	STD A	STD B
Mean	5,786	4,943	5,976	5,578	4,649	154	425
REF	5,740	4,960	5,850	5,533	4,599		
diff (mean-REF)	0,046	-0,016	0,125	0,045	0,050		
S	0,055	0,021	0,100	0,044	0,031		
Z-value	0,84	-0,78	1,25	1,02	1,59		
REFCert						154 ± 10 %	420 ± 10 %
Mean×100/REFCert (%)						100	101

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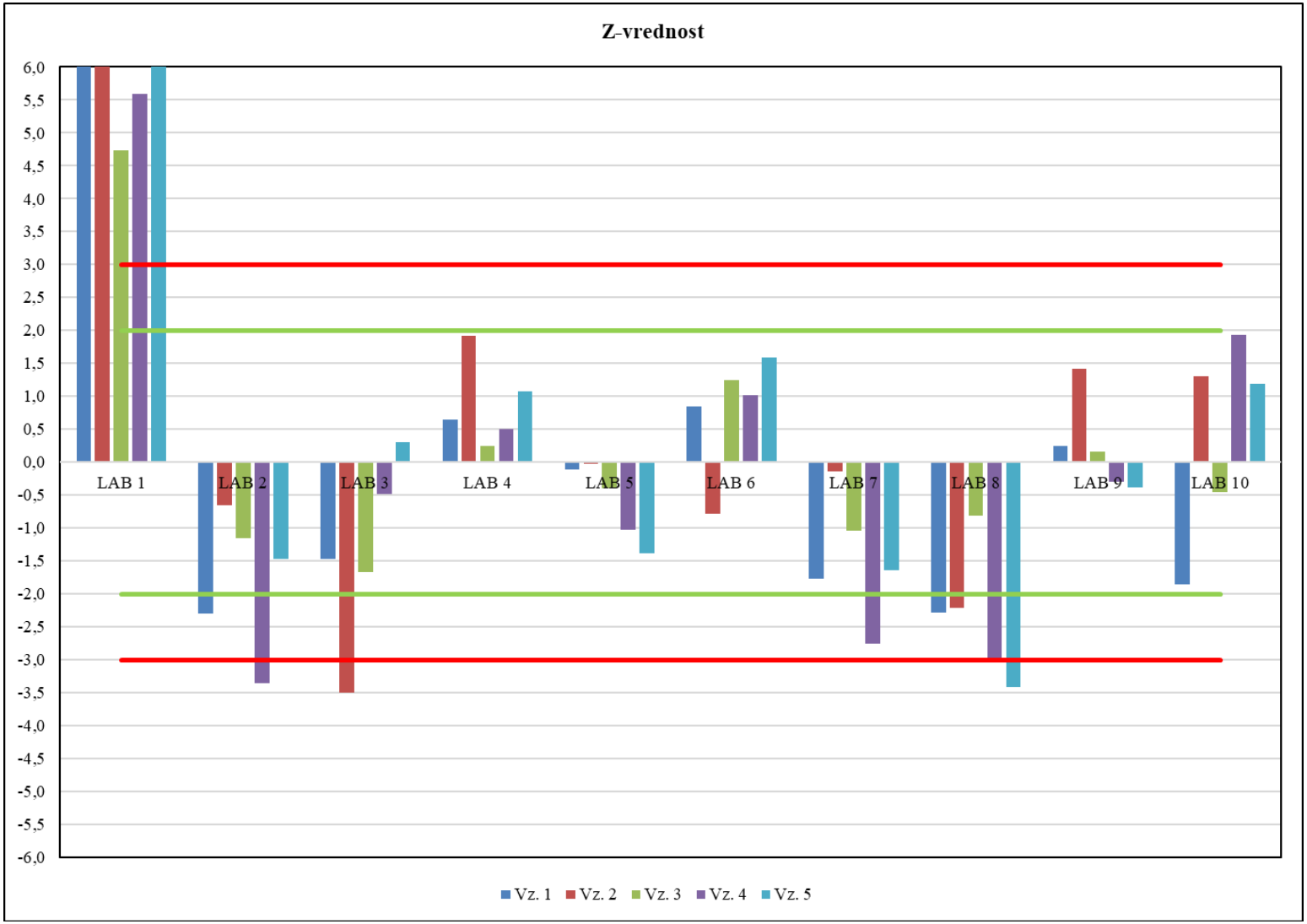
LAB 7	1	2	3	4	5	STD A	STD B
Mean	5,643	4,957	5,746	5,413	4,548	139	417
REF	5,740	4,960	5,850	5,533	4,599		
diff (mean-REF)	-0,097	-0,003	-0,104	-0,121	-0,052		
S	0,055	0,021	0,100	0,044	0,031		
Z-value	-1,76	-0,14	-1,04	-2,76	-1,64		
REFCert						154 ± 10 %	420 ± 10 %
Mean×100/REFCert (%)						90	99

LAB 8	1	2	3	4	5	STD A	STD B
Mean	5,614	4,913	5,769	5,403	4,492	129	423
REF	5,740	4,960	5,850	5,533	4,599		
diff (mean-REF)	-0,125	-0,046	-0,081	-0,130	-0,107		
S	0,055	0,021	0,100	0,044	0,031		
Z-value	-2,28	-2,22	-0,81	-2,98	-3,41		
REFCert						154 ± 10 %	420 ± 10 %
Mean×100/REFCert (%)						84	101

LAB 9	1	2	3	4	5	STD A	STD B
Mean	5,753	4,989	5,866	5,521	4,587	142	444
REF	5,740	4,960	5,850	5,533	4,599		
diff (mean-REF)	0,013	0,030	0,016	-0,013	-0,012		
S	0,055	0,021	0,100	0,044	0,031		
Z-value	0,24	1,42	0,16	-0,29	-0,38		
REFCert						154 ± 10 %	420 ± 10 %
Mean×100/REFCert (%)						92	106

LAB 10	1	2	3	4	5	STD A	STD B
Mean	5,637	4,987	5,805	5,618	4,637	172	377
REF	5,740	4,960	5,850	5,533	4,599		
diff (mean-REF)	-0,102	0,027	-0,045	0,085	0,037		
S	0,055	0,021	0,100	0,044	0,031		
Z-value	-1,86	1,30	-0,45	1,94	1,19		
REFCert						154 ± 10 %	420 ± 10 %
Mean×100/REFCert (%)						112	90

Graph 1: Z-value (see Table 4)



Limits: $|Z| \leq 2{,}00$ satisfactoy $2{,}00 < |Z| < 3{,}00$ questionable $|Z| \geq 3{,}00$ unsatisfactory