



INŠTITUT ZA MLEKARSTVO IN PROBIOTIKE
INSTITUTE OF DAIRY SCIENCE & PROBIOTICS

PROFICIENCY TESTING

**Total bacterial count –
Instrumental method IBC/ml**

NOVEMBER

2023

Dear Sir/Madam!

Thank you for participating in the proficiency testing NOVEMBER 2023. 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: 5304-1123 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

$mean = \frac{\sum x_n}{N}$	<i>mean</i> = average sample value x_n = value of sample n N = number of samples
$diff = \bar{x}_n - REF$	<i>diff</i> = deviation of sample value from reference value \bar{x}_n = average sample value <i>REF</i> = robust average sample value
$Z - value = \frac{\bar{x}_n - REF}{S}$	\bar{x}_n = average sample value <i>REF</i> = robust average sample value S = standard deviation of robust average sample value (<i>ref</i>)
	Z ≤ 2,00 satisfactory
	2,00 < Z < 3,00 questionable
	Z ≥ 3,00 unsatisfactory
$d = \frac{\sum(\bar{x}_n - REF)}{N}$	d = average of deviations x_n = value of sample n N = number of samples <i>REF</i> = robust average sample value
$Sd = \sqrt{\frac{\sum(\bar{x}_n - REF)^2}{N}}$	Sd = standard deviation of deviations x_n = value of sample n N = number of samples <i>REF</i> = robust average sample value
<i>REF</i>	Value <i>REF</i> 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 ($\alpha=0,05$)

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Table 2: Outliers detection according to Grubbs method ($\alpha = 0,05$)

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

Legend:

n = number of outliers

Table 3: Repeatability (log IBC/ml)

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

Legend:

Sr = Standard deviation of repeatability (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

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

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

Table 4: Accuracy (log IBC/ml)

LAB 1	1	2	3	4	5	STD A	STD B
Mean	5,817	4,588	5,982	5,086	5,287	157	197
REF	5,641	4,505	5,865	4,991	5,196		
diff (mean-REF)	0,176	0,082	0,117	0,096	0,091		
S	0,112	0,035	0,077	0,048	0,077		
Z-value	1,57	2,36	1,53	2,00	1,17		
REFCert						156 ± 10 %	449 ± 10 %
Mean×100/REFCert (%)						101	44

LAB 2	1	2	3	4	5	STD A	STD B
Mean	5,605	4,488	5,839	5,018	5,277	145	412
REF	5,641	4,505	5,865	4,991	5,196		
diff (mean-REF)	-0,035	-0,018	-0,026	0,027	0,081		
S	0,112	0,035	0,077	0,048	0,077		
Z-value	-0,31	-0,51	-0,34	0,57	1,05		
REFCert						156 ± 10 %	449 ± 10 %
Mean×100/REFCert (%)						93	92

LAB 3	1	2	3	4	5	STD A	STD B
Mean	5,400	4,535	5,648	4,886	5,065	205	529
REF	5,641	4,505	5,865	4,991	5,196		
diff (mean-REF)	-0,241	0,030	-0,217	-0,105	-0,131		
S	0,112	0,035	0,077	0,048	0,077		
Z-value	-2,14	0,85	-2,83	-2,20	-1,70		
REFCert						196 ± 10 %	573 ± 10 %
Mean×100/REFCert (%)						105	92

LAB 4	1	2	3	4	5	STD A	STD B
Mean	5,529	4,465	5,805	4,945	5,154	137	416
REF	5,641	4,505	5,865	4,991	5,196		
diff (mean-REF)	-0,112	-0,040	-0,060	-0,046	-0,042		
S	0,112	0,035	0,077	0,048	0,077		
Z-value	-0,99	-1,15	-0,79	-0,96	-0,55		
REFCert						156 ± 10 %	449 ± 10 %
Mean×100/REFCert (%)						88	93

LAB 5	1	2	3	4	5	STD A	STD B
Mean	5,627	4,503	5,840	4,961	5,111	159	452
REF	5,641	4,505	5,865	4,991	5,196		
diff (mean-REF)	-0,013	-0,002	-0,025	-0,030	-0,085		
S	0,112	0,035	0,077	0,048	0,077		
Z-value	-0,12	-0,06	-0,32	-0,63	-1,10		
REFCert						156 ± 10 %	449 ± 10 %
Mean×100/REFCert (%)						102	101

To be continued...

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LAB 6	1	2	3	4	5	STD A	STD B
Mean	5,808	4,477	5,994	5,042	5,267	164	467
REF	5,641	4,505	5,865	4,991	5,196		
diff (mean-REF)	0,167	-0,029	0,129	0,051	0,070		
S	0,112	0,035	0,077	0,048	0,077		
Z-value	1,49	-0,82	1,69	1,06	0,91		
REFCert						156 ± 10 %	449 ± 10 %
Mean×100/REFCert (%)						105	104

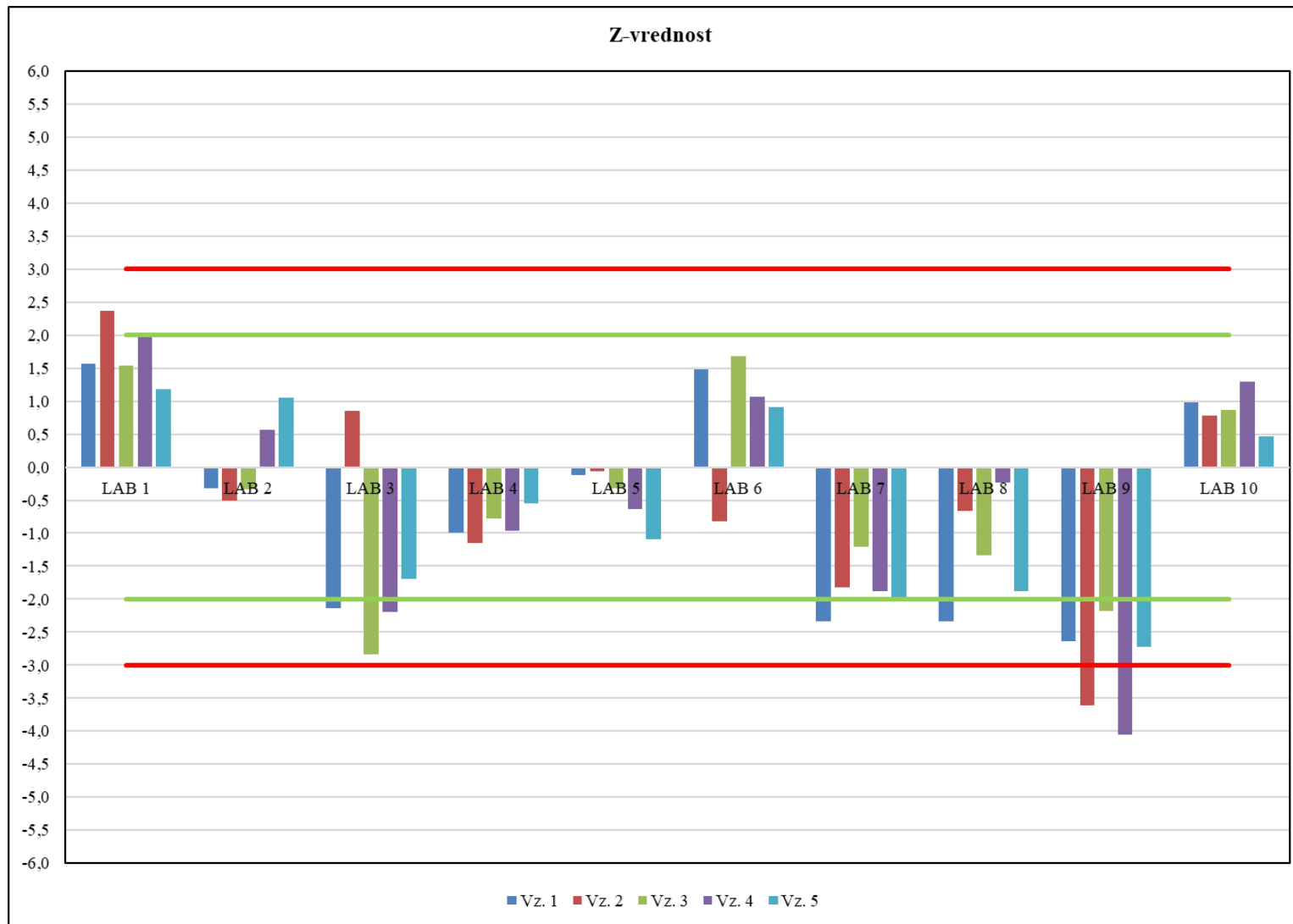
LAB 7	1	2	3	4	5	STD A	STD B
Mean	5,378	4,442	5,772	4,901	5,039	158	476
REF	5,641	4,505	5,865	4,991	5,196		
diff (mean-REF)	-0,263	-0,063	-0,093	-0,090	-0,157		
S	0,112	0,035	0,077	0,048	0,077		
Z-value	-2,33	-1,82	-1,21	-1,88	-2,03		
REFCert						156 ± 10 %	449 ± 10 %
Mean×100/REFCert (%)						101	106

LAB 8	1	2	3	4	5	STD A	STD B
Mean	5,377	4,482	5,762	4,979	5,051	140	492
REF	5,641	4,505	5,865	4,991	5,196		
diff (mean-REF)	-0,263	-0,023	-0,103	-0,011	-0,145		
S	0,112	0,035	0,077	0,048	0,077		
Z-value	-2,34	-0,66	-1,34	-0,24	-1,88		
REFCert						156 ± 10 %	449 ± 10 %
Mean×100/REFCert (%)						90	110

LAB 9	1	2	3	4	5	STD A	STD B
Mean	5,344	4,379	5,698	4,797	4,986	149	464
REF	5,641	4,505	5,865	4,991	5,196		
diff (mean-REF)	-0,297	-0,126	-0,167	-0,194	-0,211		
S	0,112	0,035	0,077	0,048	0,077		
Z-value	-2,64	-3,61	-2,18	-4,06	-2,73		
REFCert						156 ± 10 %	449 ± 10 %
Mean×100/REFCert (%)						95	103

LAB 10	1	2	3	4	5	STD A	STD B
Mean	5,752	4,533	5,931	5,053	5,232	148	392
REF	5,641	4,505	5,865	4,991	5,196		
diff (mean-REF)	0,111	0,027	0,066	0,062	0,036		
S	0,112	0,035	0,077	0,048	0,077		
Z-value	0,99	0,79	0,86	1,29	0,47		
REFCert						156 ± 10 %	449 ± 10 %
Mean×100/REFCert (%)						95	87

Graph 1: Z-value (see Table 4)



Limits: $|Z| \leq 2,00$ satisfactory $2,00 < |Z| < 3,00$ questionable $|Z| \geq 3,00$ unsatisfactory