



INŠTITUT ZA MLEKARSTVO IN PROBIOTIKE
INSTITUTE OF DAIRY SCIENCE & PROBIOTICS

PROFICIENCY TESTING

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

NOVEMBER

2024

Dear Sir/Madam!

Thank you for participating in the proficiency testing NOVEMBER 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: 5315-1124 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						50
2						0
3						0
4						0
5						0
6						0
7						0
8						0
9						0
10						0
11						50
12						0
n	20	20	20	20	20	

Legend:

n = number of outliers

Table 3: Repeatability (log IBC/ml)

Laboratory	Sample (Sr)						
	1	2	3	4	5	A	B
1	0,04	0,27	0,02	0,05	0,02	0,06	0,08
2	0,05	0,03	0,02	0,01	0,01	0,03	0,01
3	0,02	0,08	0,03	0,02	0,01	0,03	0,02
4	0,02	0,03	0,02	0,01	0,01	0,03	0,01
5	0,01	0,03	0,01	0,01	0,01	0,01	0,01
6	0,02	0,04	0,02	0,02	0,01	0,02	0,01
7	0,03	0,04	0,01	0,01	0,01	0,02	0,01
8	0,03	0,05	0,02	0,01	0,01	0,02	0,02
9	0,02	0,03	0,02	0,01	0,01	0,01	0,01
10	0,02	0,04	0,01	0,01	0,02	*	*
11	0,04	0,09	0,02	0,02	0,08	0,09	0,07
12	0,04	0,06	0,02	0,01	0,02	0,01	0,01

Legend:

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

* = laboratory did not presented the results

Note:

Repeatability values for Bactocount instruments were calculated after recalculation of the returned results using a factor of 1,22824029 (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	
51 – 200	0,05	1,2,A
> 200	0,04	3,4,5,B
Total range	0,05	

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

Table 4: Accuracy (log IBC/ml)

LAB 1	1	2	3	4	5	STD A	STD B
Mean	6,286	5,378	6,229	6,706	6,479	3421	1438
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	1,257	0,665	0,891	0,401	0,758		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	80,89	25,51	62,12	17,35	32,46		
REFCert						189 ± 10 %	517 ± 10 %
Mean×100/REFCert (%)						1810	278

LAB 2	1	2	3	4	5	STD A	STD B
Mean	5,020	4,716	5,344	6,300	5,687	146	443
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	-0,009	0,003	0,006	-0,005	-0,034		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	-0,55	0,11	0,41	-0,20	-1,45		
REFCert						158 ± 10 %	468 ± 10 %
Mean×100/REFCert (%)						92	95

LAB 3	1	2	3	4	5	STD A	STD B
Mean	5,029	4,757	5,331	6,276	5,904	178	513
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	0,000	0,044	-0,007	-0,029	0,183		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	-0,01	1,67	-0,49	-1,25	7,83		
REFCert						189 ± 10 %	517 ± 10 %
Mean×100/REFCert (%)						94	99

LAB 4	1	2	3	4	5	STD A	STD B
Mean	5,089	4,771	5,451	6,366	5,749	154	484
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	0,060	0,058	0,113	0,061	0,028		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	3,88	2,23	7,87	2,62	1,20		
REFCert						158 ± 10 %	468 ± 10 %
Mean×100/REFCert (%)						98	103

LAB 5	1	2	3	4	5	STD A	STD B
Mean	5,024	4,697	5,335	6,335	5,723	154	458
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	-0,005	-0,016	-0,003	0,030	0,002		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	-0,31	-0,60	-0,20	1,29	0,07		
REFCert						158 ± 10 %	468 ± 10 %
Mean×100/REFCert (%)						97	98

LAB 6	1	2	3	4	5	STD A	STD B
Mean	4,937	4,589	5,243	6,194	5,553	153	459
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	-0,092	-0,124	-0,095	-0,111	-0,168		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	-5,91	-4,76	-6,63	-4,79	-7,19		
REFCert						158 ± 10 %	468 ± 10 %
Mean×100/REFCert (%)						97	98

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LAB 7	1	2	3	4	5	STD A	STD B
Mean	5,113	4,790	5,469	6,420	5,818	166	471
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	0,085	0,077	0,132	0,115	0,097		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	5,45	2,96	9,17	4,95	4,14		
REFCert						158 ± 10 %	468 ± 10 %
Mean×100/REFCert (%)						105	101

LAB 8	1	2	3	4	5	STD A	STD B
Mean	5,119	4,764	5,456	6,403	5,803	164	484
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	0,090	0,051	0,119	0,099	0,082		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	5,82	1,96	8,27	4,26	3,52		
REFCert						158 ± 10 %	468 ± 10 %
Mean×100/REFCert (%)						104	103

LAB 9	1	2	3	4	5	STD A	STD B
Mean	5,006	4,685	5,329	6,319	5,742	161	484
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	-0,023	-0,028	-0,009	0,015	0,020		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	-1,47	-1,08	-0,65	0,63	0,88		
REFCert						158 ± 10 %	468 ± 10 %
Mean×100/REFCert (%)						102	103

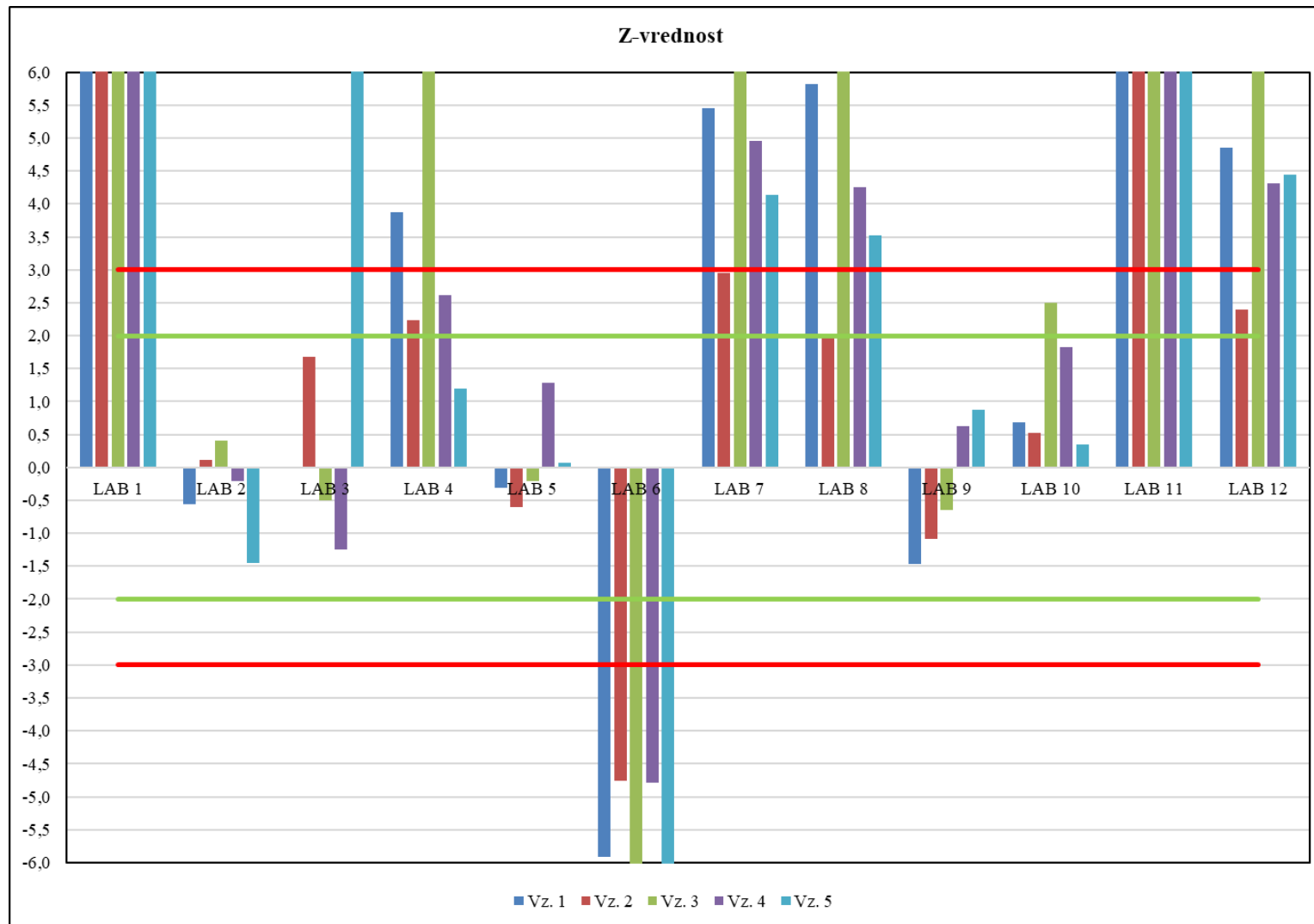
LAB 10	1	2	3	4	5	STD A	STD B
Mean	5,039	4,727	5,374	6,347	5,729	*	*
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	0,011	0,014	0,036	0,042	0,008		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	0,68	0,53	2,50	1,83	0,35		
REFCert						158 ± 10 %	468 ± 10 %
Mean×100/REFCert (%)						/	/

LAB 11	1	2	3	4	5	STD A	STD B
Mean	6,841	5,649	6,316	6,879	6,095	145	513
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	1,813	0,936	0,978	0,574	0,374		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	116,65	35,93	68,18	24,81	16,03		
REFCert						194 ± 10 %	575 ± 10 %
Mean×100/REFCert (%)						75	89

LAB 12	1	2	3	4	5	STD A	STD B
Mean	5,104	4,776	5,440	6,405	5,825	167	516
REF	5,029	4,713	5,338	6,305	5,721		
diff (mean-REF)	0,075	0,062	0,103	0,100	0,104		
S	0,016	0,026	0,014	0,023	0,023		
Z-value	4,85	2,40	7,16	4,31	4,44		
REFCert						158 ± 10 %	468 ± 10 %
Mean×100/REFCert (%)						106	110

* = laboratory did not presented the results

Graph 1: Z-value (see Table 4)



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