



INŠTITUT ZA MLEKARSTVO IN PROBIOTIKE
INSTITUTE OF DAIRY SCIENCE & PROBIOTICS

PROFICIENCY TESTING

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

MARCH

2023

Dear Sir/Madam!

Thank you for participating in the proficiency testing MARCH 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: 1156-0323 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
$d = \frac{\sum(\bar{x}_n - REF)}{N}$	<i>d</i> = average of deviations x_n = value of sample n N = number of samples <i>REF</i> = robust average sample value
$Sd = \sqrt{\frac{\sum(\bar{x}_n - REF)^2}{N}}$	<i>Sd</i> = 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	6	7	
1								0
2								0
3								0
4								0
5								0
6								0
7								0
8								0
9								2
10								0
n	0	0	0	0	0	0	2	

Legend:

n = number of outliers

Table 3: Repeatability (log IBC/ml)

Laboratory	Sample (Sr)								A	B
	1	2	3	4	5	6	7			
1	0,01	0,03	0,04	0,03	0,03	0,01	0,02	0,02	0,01	
2	0,02	0,03	0,02	0,04	0,04	0,02	0,01	0,02	0,02	
3	0,02	0,02	0,02	0,03	0,05	0,02	0,01	0,01	0,02	
4	0,03	0,03	0,01	0,04	0,04	0,01	0,01	0,02	0,01	
5	0,01	0,03	0,01	0,03	0,03	0,01	0,01	0,01	0,01	
6	0,01	0,03	0,02	0,02	0,02	0,02	0,01	0,02	0,01	
7	0,03	0,03	0,01	0,03	0,02	0,01	0,01	0,02	0,02	
8	0,04	0,03	0,04	0,03	0,03	0,03	0,01	0,02	0,02	
9	0,05	0,01	0,02	0,02	0,01	0,01	0,01	0,17	0,02	
10	0,02	0,03	0,01	0,05	0,04	*	*	0,08	0,06	

* - laboratory did not presented the results

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 1,222050835 (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	2, 4
51 – 200	0,05	5, 6, A
> 200	0,04	1, 3, 7, B
Total range	0,05	

Bentley Bactocount IBC		
Range (x 1000 IBC/ml)	Sr (log IBC/ml)	Sample
10 – 50	0,07	2, 4
51 – 100	0,06	5
101 – 300	0,05	6, A
> 300	0,03	1, 3, 7, B

Table 4: Accuracy (log IBC/ml)

LAB 1	1	2	3	4	5	6	7	STD A	STD B
Mean	5,566	4,580	5,786	4,585	4,925	5,230	5,687	152	443
REF	5,542	4,570	5,464	4,574	4,928	5,176	5,632		
diff (mean-REF)	0,024	0,010	0,322	0,011	-0,003	0,055	0,056		
S	0,043	0,049	0,158	0,042	0,057	0,043	0,045		
Z-value	0,56	0,20	2,04	0,26	-0,05	1,27	1,25		
REFCert								152 ± 10 %	422 ± 10 %
Mean×100/REFCert (%)								100	105

LAB 2	1	2	3	4	5	6	7	STD A	STD B
Mean	5,469	4,504	5,432	4,514	4,870	5,128	5,603	146	426
REF	5,542	4,570	5,464	4,574	4,928	5,176	5,632		
diff (mean-REF)	-0,074	-0,066	-0,032	-0,060	-0,058	-0,047	-0,028		
S	0,043	0,049	0,158	0,042	0,057	0,043	0,045		
Z-value	-1,73	-1,33	-0,20	-1,42	-1,02	-1,09	-0,64		
REFCert								152 ± 10 %	422 ± 10 %
Mean×100/REFCert (%)								96	101

LAB 3	1	2	3	4	5	6	7	STD A	STD B
Mean	5,794	4,817	5,332	4,774	5,217	5,280	5,692	247	670
REF	5,542	4,570	5,464	4,574	4,928	5,176	5,632		
diff (mean-REF)	0,251	0,247	-0,132	0,200	0,289	0,105	0,060		
S	0,043	0,049	0,158	0,042	0,057	0,043	0,045		
Z-value	5,91	4,99	-0,84	4,71	5,09	2,43	1,35		
REFCert								185 ± 10 %	513 ± 10 %
Mean×100/REFCert (%)								134	131

LAB 4	1	2	3	4	5	6	7	STD A	STD B
Mean	5,588	4,631	5,734	4,610	5,008	5,192	5,665	174	512
REF	5,542	4,570	5,464	4,574	4,928	5,176	5,632		
diff (mean-REF)	0,046	0,060	0,270	0,036	0,080	0,017	0,033		
S	0,043	0,049	0,158	0,042	0,057	0,043	0,045		
Z-value	1,08	1,22	1,71	0,85	1,41	0,39	0,74		
REFCert								152 ± 10 %	422 ± 10 %
Mean×100/REFCert (%)								115	121

LAB 5	1	2	3	4	5	6	7	STD A	STD B
Mean	5,495	4,541	5,326	4,548	4,887	5,159	5,577	149	440
REF	5,542	4,570	5,464	4,574	4,928	5,176	5,632		
diff (mean-REF)	-0,047	-0,030	-0,138	-0,026	-0,041	-0,017	-0,054		
S	0,043	0,049	0,158	0,042	0,057	0,043	0,045		
Z-value	-1,11	-0,60	-0,87	-0,62	-0,72	-0,39	-1,22		
REFCert								152 ± 10 %	422 ± 10 %
Mean×100/REFCert (%)								98	104

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LAB 6	1	2	3	4	5	6	7	STD A	STD B
Mean	5,517	4,518	5,293	4,537	4,871	5,129	5,593	144	435
REF	5,542	4,570	5,464	4,574	4,928	5,176	5,632		
diff (mean-REF)	-0,025	-0,053	-0,171	-0,037	-0,057	-0,046	-0,039		
S	0,043	0,049	0,158	0,042	0,057	0,043	0,045		
Z-value	-0,59	-1,06	-1,09	-0,87	-1,00	-1,07	-0,87		
REFCert								152 ± 10 %	422 ± 10 %
Mean×100/REFCert (%)								95	103

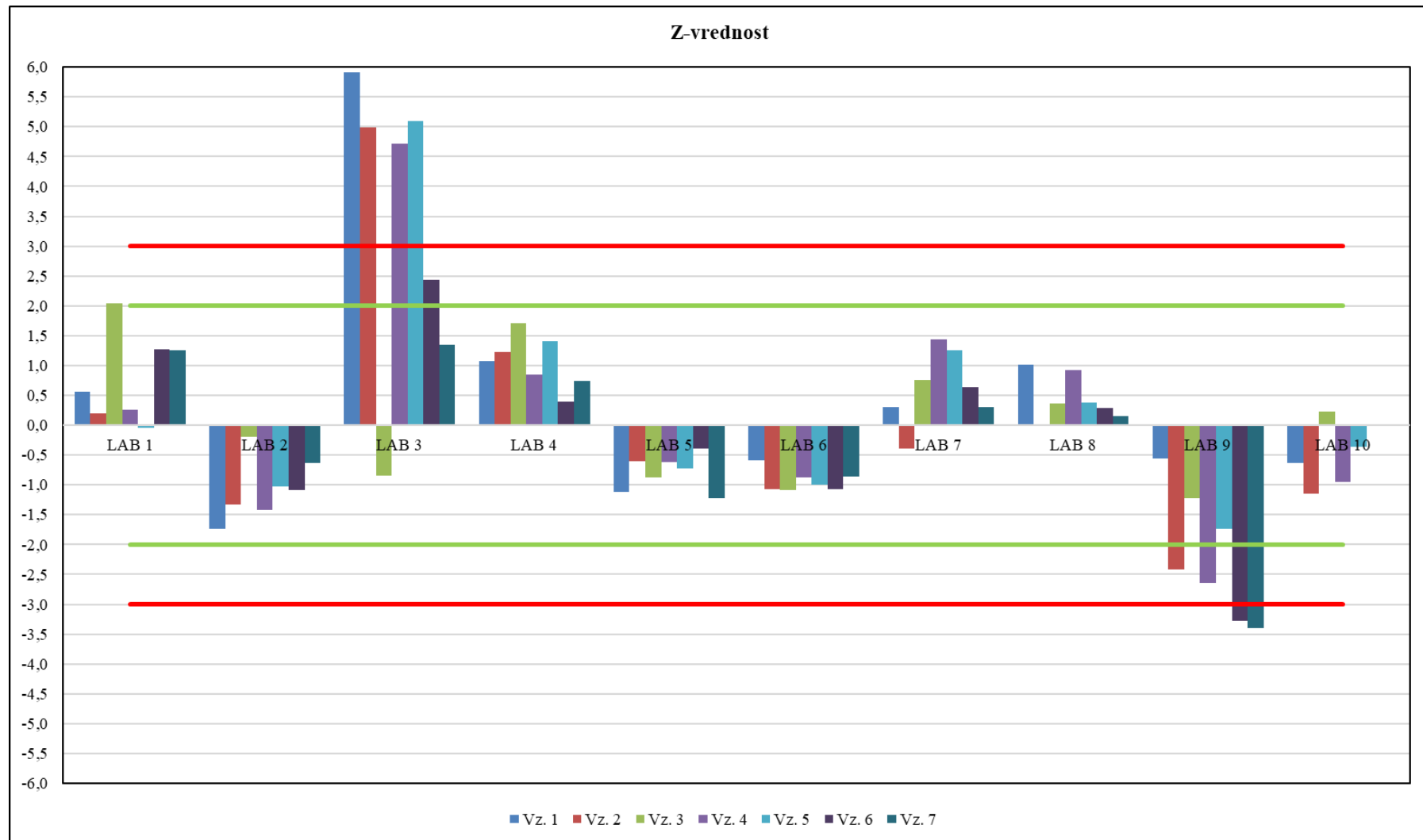
LAB 7	1	2	3	4	5	6	7	STD A	STD B
Mean	5,555	4,551	5,585	4,635	4,999	5,203	5,645	180	474
REF	5,542	4,570	5,464	4,574	4,928	5,176	5,632		
diff (mean-REF)	0,013	-0,020	0,121	0,061	0,071	0,028	0,014		
S	0,043	0,049	0,158	0,042	0,057	0,043	0,045		
Z-value	0,31	-0,40	0,76	1,44	1,25	0,64	0,31		
REFCert								152 ± 10 %	422 ± 10 %
Mean×100/REFCert (%)								118	112

LAB 8	1	2	3	4	5	6	7	STD A	STD B
Mean	5,585	4,571	5,521	4,613	4,950	5,188	5,639	169	507
REF	5,542	4,570	5,464	4,574	4,928	5,176	5,632		
diff (mean-REF)	0,043	0,000	0,057	0,039	0,022	0,012	0,007		
S	0,043	0,049	0,158	0,042	0,057	0,043	0,045		
Z-value	1,01	0,01	0,36	0,92	0,38	0,29	0,16		
REFCert								152 ± 10 %	422 ± 10 %
Mean×100/REFCert (%)								111	120

LAB 9	1	2	3	4	5	6	7	STD A	STD B
Mean	5,519	4,451	5,270	4,462	4,829	5,034	5,481	97	369
REF	5,542	4,570	5,464	4,574	4,928	5,176	5,632		
diff (mean-REF)	-0,024	-0,119	-0,194	-0,112	-0,099	-0,141	-0,151		
S	0,043	0,049	0,158	0,042	0,057	0,043	0,045		
Z-value	-0,56	-2,42	-1,23	-2,65	-1,74	-3,28	-3,39		
REFCert								152 ± 10 %	422 ± 10 %
Mean×100/REFCert (%)								64	88

LAB 10	1	2	3	4	5	6	7	STD A	STD B
Mean	5,515	4,514	5,500	4,534	4,907			146	354
REF	5,542	4,570	5,464	4,574	4,928				
diff (mean-REF)	-0,027	-0,057	0,036	-0,040	-0,021				
S	0,043	0,049	0,158	0,042	0,057				
Z-value	-0,64	-1,15	0,23	-0,95	-0,36				
REFCert								152 ± 10 %	422 ± 10 %
Mean×100/REFCert (%)								96	84

Graph 1: Z-value (see Table 4)



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