



INŠTITUT ZA MLEKARSTVO IN PROBIOTIKE
INSTITUTE OF DAIRY SCIENCE & PROBIOTICS

PROFICIENCY TESTING

Somatic cell count

NOVEMBER

2025

Dear Sir/Madam!

Thank you for participating in the proficiency testing NOVEMBER 2025. 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: 5351-1125 for parameter SOMATIC CELL COUNT in milk and they are presented in the form of tables and graphs.

Table 1: Used statistics

$mean = \frac{\sum x_n}{N}$	$povp$ = average sample value x_n = value of sample n N = number of samples
$diff = \bar{x}_n - ref$	$diff$ = deviation of sample value from reference value $\bar{x}_n$ = average sample value ref = robust average sample value
$Z - value = \frac{\bar{x}_n - ref}{S}$	$\bar{x}_n$ = average sample value ref = robust average sample value S = standard deviation of robust average sample value (ref)
	$ Z \leq 2,00$ satisfactory
	$2,00 < Z < 3,00$ questionable
	$ Z \geq 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 ref = 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 ref = robust average sample value
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 ($\alpha=0,05$)

Responsible for sample preparation and statistical analysis of results:

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Head of laboratory:

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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						2
10						0
11						0
12						0
13						0
n	0	0	0	0	2	

Legend:

n = number of outliers

Table 3: Repeatability (somatic cells×1000/ml)

Laboratory	Sample (r)					N	Sr
	1	2	3	4	5		
1	5	14	12	0	9	5	5
2	6	20	2	19	37	5	12
3	1	6	4	2	36	5	13
4	11	2	4	14	23	5	8
5	7	3	34	12	3	5	12
6	3	1	2	4	6	5	2
7	8	2	19	5	15	5	6
8	8	9	20	9	28	5	8
9	1	5	12	6	32	5	11
10	7	10	10	5	42	5	14
11	3	3	27	2	2	5	10
12	10	7	10	8	12	5	2
13	8	20	27	2	17	5	9
N	13	13	13	13	13		
Sr	3	7	11	6	14		

Legend:

r = repeatability; absolute difference between two measurements of the same sample

N = number of measurements

Sr = standard deviation of repeatability

Limits (ISO 13366-2/IDF148-2:2006):

Range (SCC×1000/ml)	150	300	450	750	1.500
r (SCC×1000/ml):	25	42	50	63	126

Table 4: Accuracy (SCC×1000/ml)

Laboratory	Sample	1	2	3	4	5	d %	Sd %
1	Mean	138,5	364,0	947,0	248,0	1447,5		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	-2,4	-9,6	-2,1	2,1	-4,0		
	d %	-1,7	-2,6	-0,2	0,8	-0,3	-0,8	1,3
	Z-value	-0,29	-0,74	-0,06	0,17	-0,10		

Laboratory	Sample	1	2	3	4	5	d	Sd
2	Mean	141,0	397,0	1025,0	254,5	1483,5		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	0,1	23,4	75,9	8,6	32,0		
	d %	0,1	6,3	8,0	3,5	2,2	4,0	3,2
	Z-value	0,02	1,80	2,11	0,69	0,82		

Laboratory	Sample	1	2	3	4	5	d	Sd
3	Mean	139,5	374,0	935,0	249,0	1460,0		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	-1,4	0,4	-14,1	3,1	8,5		
	d %	-1,0	0,1	-1,5	1,3	0,6	-0,1	1,1
	Z-value	-0,17	0,03	-0,39	0,25	0,22		

Laboratory	Sample	1	2	3	4	5	d	Sd
4	Mean	144,5	379,0	971,0	246,0	1510,5		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	3,6	5,4	21,9	0,1	59,0		
	d %	2,6	1,4	2,3	0,0	4,1	2,1	1,5
	Z-value	0,45	0,42	0,61	0,01	1,51		

Laboratory	Sample	1	2	3	4	5	d	Sd
5	Mean	150,5	388,5	1007,0	257,0	1469,5		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	9,6	14,9	57,9	11,1	18,0		
	d %	6,8	4,0	6,1	4,5	1,2	4,5	2,2
	Z-value	1,18	1,15	1,61	0,89	0,46		

Laboratory	Sample	1	2	3	4	5	d	Sd
6	Mean	135,5	364,5	959,0	238,0	1446,0		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	-5,4	-9,1	9,9	-7,9	-5,5		
	d %	-3,8	-2,4	1,0	-3,2	-0,4	-1,8	2,0
	Z-value	-0,66	-0,70	0,28	-0,63	-0,14		

Laboratory	Sample	1	2	3	4	5	d	Sd
7	Mean	144,0	382,0	956,5	259,5	1464,5		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	3,1	8,4	7,4	13,6	13,0		
	d %	2,2	2,3	0,8	5,5	0,9	2,3	1,9
	Z-value	0,38	0,65	0,21	1,09	0,33		

To be continued...

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Laboratory 8	Sample	1	2	3	4	5	d	Sd
	Mean	126,0	355,5	862,0	232,5	1382,0		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	-14,9	-18,1	-87,1	-13,4	-69,5		
	d %	-10,6	-4,8	-9,2	-5,5	-4,8	-7,0	2,7
	Z-value	-1,83	-1,39	-2,42	-1,08	-1,78		

Laboratory 9	Sample	1	2	3	4	5	d	Sd
	Mean	164,5	385,5	878,0	260,0	1314,0		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	23,6	11,9	-71,1	14,1	-137,5		
	d %	16,8	3,2	-7,5	5,7	-9,5	1,7	10,7
	Z-value	2,90	0,92	-1,98	1,13	-3,52		

Laboratory 10	Sample	1	2	3	4	5	d	Sd
	Mean	143,5	376,0	947,0	248,5	1479,0		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	2,6	2,4	-2,1	2,6	27,5		
	d %	1,9	0,6	-0,2	1,0	1,9	1,0	0,9
	Z-value	0,32	0,19	-0,06	0,21	0,70		

Laboratory 11	Sample	1	2	3	4	5	d	Sd
	Mean	138,5	371,5	950,5	236,0	1470,0		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	-2,4	-2,1	1,4	-9,9	18,5		
	d %	-1,7	-0,6	0,1	-4,0	1,3	-1,0	2,0
	Z-value	-0,29	-0,16	0,04	-0,79	0,47		

Laboratory 12	Sample	1	2	3	4	5	d	Sd
	Mean	142,0	367,5	937,0	239,0	1439,0		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	1,1	-6,1	-12,1	-6,9	-12,5		
	d %	0,8	-1,6	-1,3	-2,8	-0,9	-1,2	1,3
	Z-value	0,14	-0,47	-0,34	-0,55	-0,32		

Laboratory 13	Sample	1	2	3	4	5	d	Sd
	Mean	131,0	350,0	945,5	229,0	1418,5		
	REF	140,9	373,6	949,1	245,9	1451,5		
	S	8,1	13,0	35,9	12,5	39,0		
	d (mean - REF)	-9,9	-23,6	-3,6	-16,9	-33,0		
	d %	-7,0	-6,3	-0,4	-6,9	-2,3	-4,6	3,0
	Z-value	-1,21	-1,82	-0,10	-1,36	-0,85		

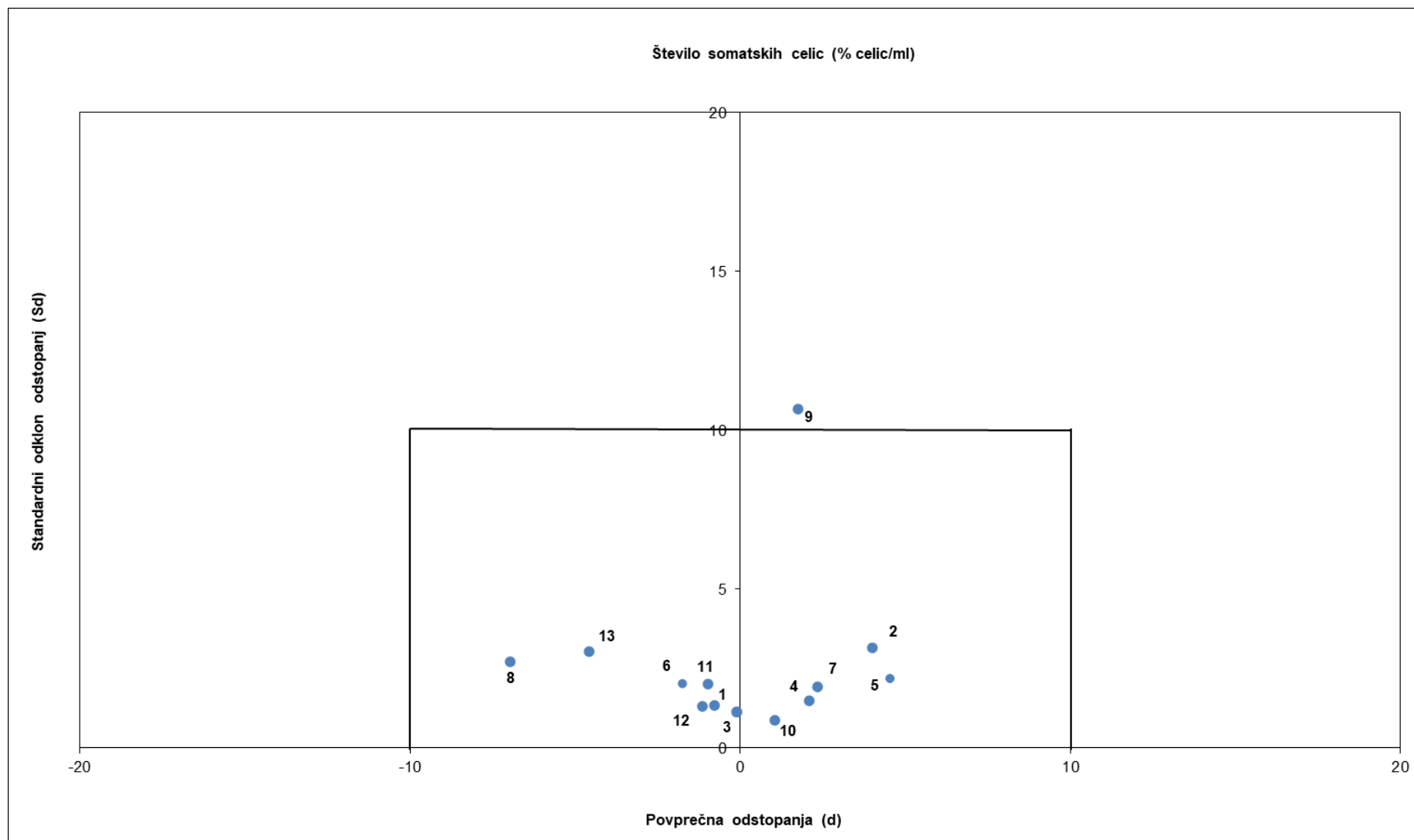
Limits: d = ± 10 % cells/ml Sd = 10 % cells/ml

Tabela 5: Repeatability (S_r) and reproducibility (S_R) (ISO 5725-2:2003)

	Vzorec				
	1	2	3	4	5
Mean (SCC×1000/ml)	141	373	948	246	1456
S_r (SCC×1000/ml)	5	7	10	6	16
S_r , %	3	2	1	2	1
S_R (SCC×1000/ml)	10	14	44	11	35
S_R , %	7	4	5	5	2

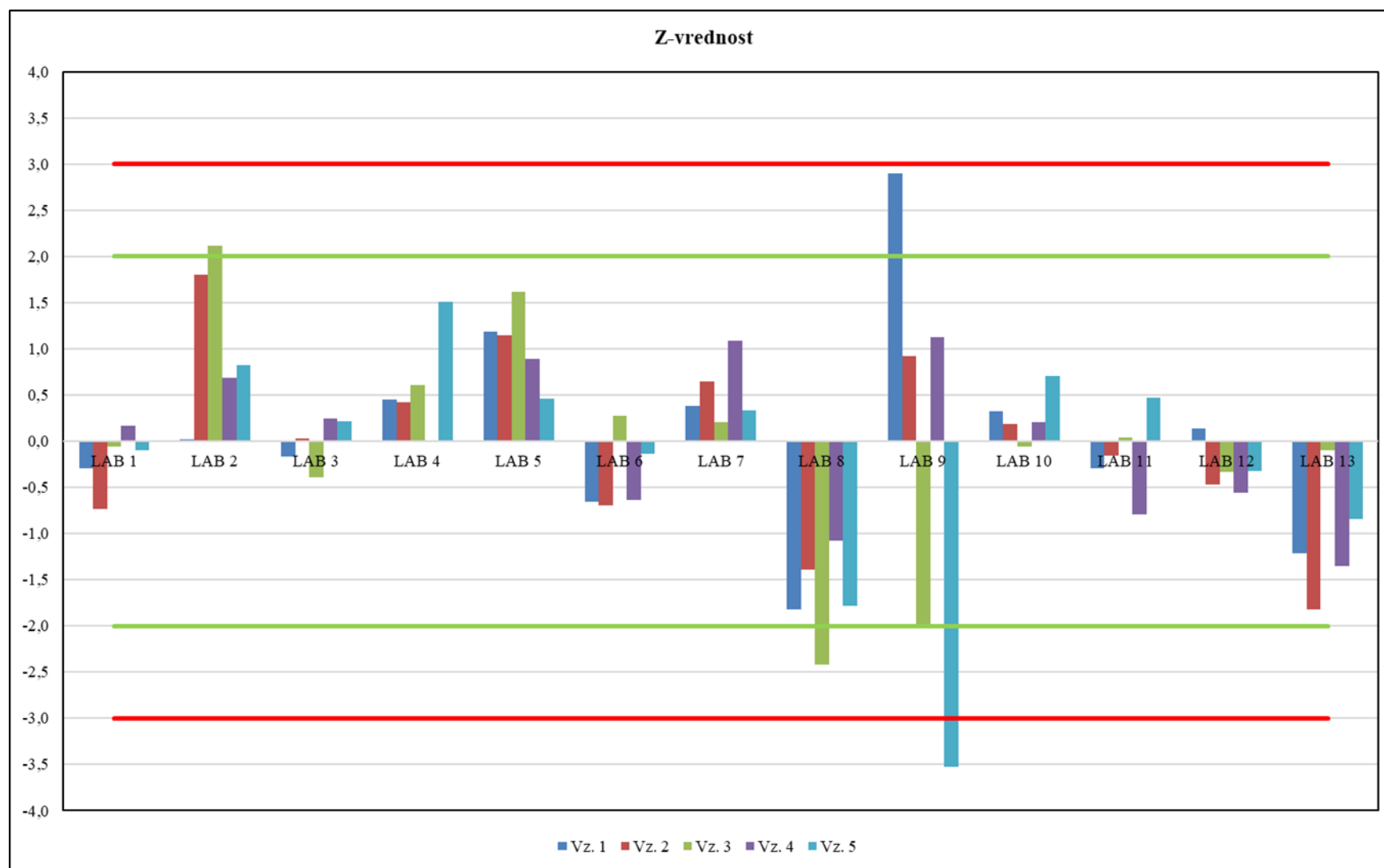
Limits (ISO 13366-2/IDF148-2:2006):	Range (SSC×1000/ml)				
	150	300	450	750	1.500
S_r (SCC×1000/ml):	25	42	50	63	126
S_r , %	6	5	4	3	3
S_R (SSC×1000/ml):	38	67	88	126	252
S_R , %	9	8	7	6	6

Figure 1: Accuracy (see Table 4)



Limits $d = \pm 10 \% \text{ cells/ml}$, $Sd = 10 \% \text{ cells/ml}$

Figure 2: Z-value (see Table 4)



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