



INŠTITUT ZA MLEKARSTVO IN PROBIOTIKE
INSTITUTE OF DAIRY SCIENCE & PROBIOTICS

PROFICIENCY TESTING

Somatic cell count

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: 1245-0323 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 ≤ 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 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						0
10						0
11						0
12						0
13						0
14						0
15						0
16						0
n	0	0	0	0	0	

Legend:

n = number of outliers

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

Laboratory	Sample (r)					N	Sr
	1	2	3	4	5		
1	13	1	5	4	7	5	4
2	8	27	21	19	6	5	8
3	10	19	13	2	2	5	7
4	8	16	7	9	6	5	4
5	5	18	5	18	2	5	7
6	5	3	10	1	0	5	4
7	0	15	15	4	3	5	6
8	7	11	14	7	8	5	3
9	1	4	0	1	1	5	1
10	3	21	12	5	4	5	7
11	4	25	11	14	3	5	8
12	11	9	5	6	1	5	3
13	4	21	16	5	6	5	7
14	6	24	3	16	4	5	8
15	14	118	15	18	7	5	42
16	8	194	40	170	26	5	78
N	16	16	16	16	16		
Sr	4	51	9	41	6		

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	177,50	1159,50	468,50	738,00	112,50		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	12,05	-30,80	10,37	-11,81	4,87	-3,06	18,15
	Z-value	0,99	-0,51	0,44	-0,44	0,73		

Laboratory	Sample	1	2	3	4	5	d	Sd
2	Mean	164,00	1128,50	442,50	747,50	104,00		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	-1,45	-61,80	-15,63	-2,31	-3,63	-16,96	25,72
	Z-value	-0,12	-1,02	-0,66	-0,09	-0,55		

Laboratory	Sample	1	2	3	4	5	d	Sd
3	Mean	169,00	1185,50	447,50	749,00	109,00		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	3,55	-4,80	-10,63	-0,81	1,37	-2,26	5,60
	Z-value	0,29	-0,08	-0,45	-0,03	0,21		

Laboratory	Sample	1	2	3	4	5	d	Sd
4	Mean	144,00	1195,00	460,50	745,50	95,00		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	-21,45	4,70	2,37	-4,31	-12,63	-6,26	10,84
	Z-value	-1,77	0,08	0,10	-0,16	-1,90		

Laboratory	Sample	1	2	3	4	5	d	Sd
5	Mean	172,50	1255,00	474,50	865,00	109,00		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	7,05	64,70	16,37	115,19	1,37	40,94	48,47
	Z-value	0,58	1,06	0,69	4,28	0,21		

Laboratory	Sample	1	2	3	4	5	d	Sd
6	Mean	156,50	1085,50	429,00	726,50	92,00		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	-8,95	-104,80	-29,13	-23,31	-15,63	-36,36	39,01
	Z-value	-0,74	-1,72	-1,23	-0,87	-2,36		

Laboratory	Sample	1	2	3	4	5	d	Sd
7	Mean	172,00	1193,50	450,50	746,00	114,50		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	6,55	3,20	-7,63	-3,81	6,87	1,04	6,48
	Z-value	0,54	0,05	-0,32	-0,14	1,04		

To be continued...

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Laboratory	Sample	1	2	3	4	5	d	Sd
8	Mean	178,50	1225,50	488,00	776,50	118,00		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	13,05	35,20	29,87	26,69	10,37	23,04	10,82
	Z-value	1,07	0,58	1,26	0,99	1,56		

Laboratory	Sample	1	2	3	4	5	d	Sd
9	Mean	151,50	1089,00	419,00	709,50	104,50		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	-13,95	-101,30	-39,13	-40,31	-3,13	-39,56	38,06
	Z-value	-1,15	-1,67	-1,65	-1,50	-0,47		

Laboratory	Sample	1	2	3	4	5	d	Sd
10	Mean	172,50	1215,50	471,00	750,50	111,00		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	7,05	25,20	12,87	0,69	3,37	9,84	9,73
	Z-value	0,58	0,41	0,54	0,03	0,51		

Laboratory	Sample	1	2	3	4	5	d	Sd
11	Mean	168,00	1244,50	475,50	785,00	107,50		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	2,55	54,20	17,37	35,19	-0,13	21,84	22,91
	Z-value	0,21	0,89	0,73	1,31	-0,02		

Laboratory	Sample	1	2	3	4	5	d	Sd
12	Mean	170,50	1225,50	483,50	767,00	109,50		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	5,05	35,20	25,37	17,19	1,87	16,94	13,90
	Z-value	0,42	0,58	1,07	0,64	0,28		

Laboratory	Sample	1	2	3	4	5	d	Sd
13	Mean	173,00	1215,50	469,00	750,50	109,00		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	7,55	25,20	10,87	0,69	1,37	9,14	9,94
	Z-value	0,62	0,41	0,46	0,03	0,21		

Laboratory	Sample	1	2	3	4	5	d	Sd
14	Mean	170,00	1235,00	472,50	739,00	108,00		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	4,55	44,70	14,37	-10,81	0,37	10,64	21,08
	Z-value	0,37	0,74	0,60	-0,40	0,06		

To be continued...

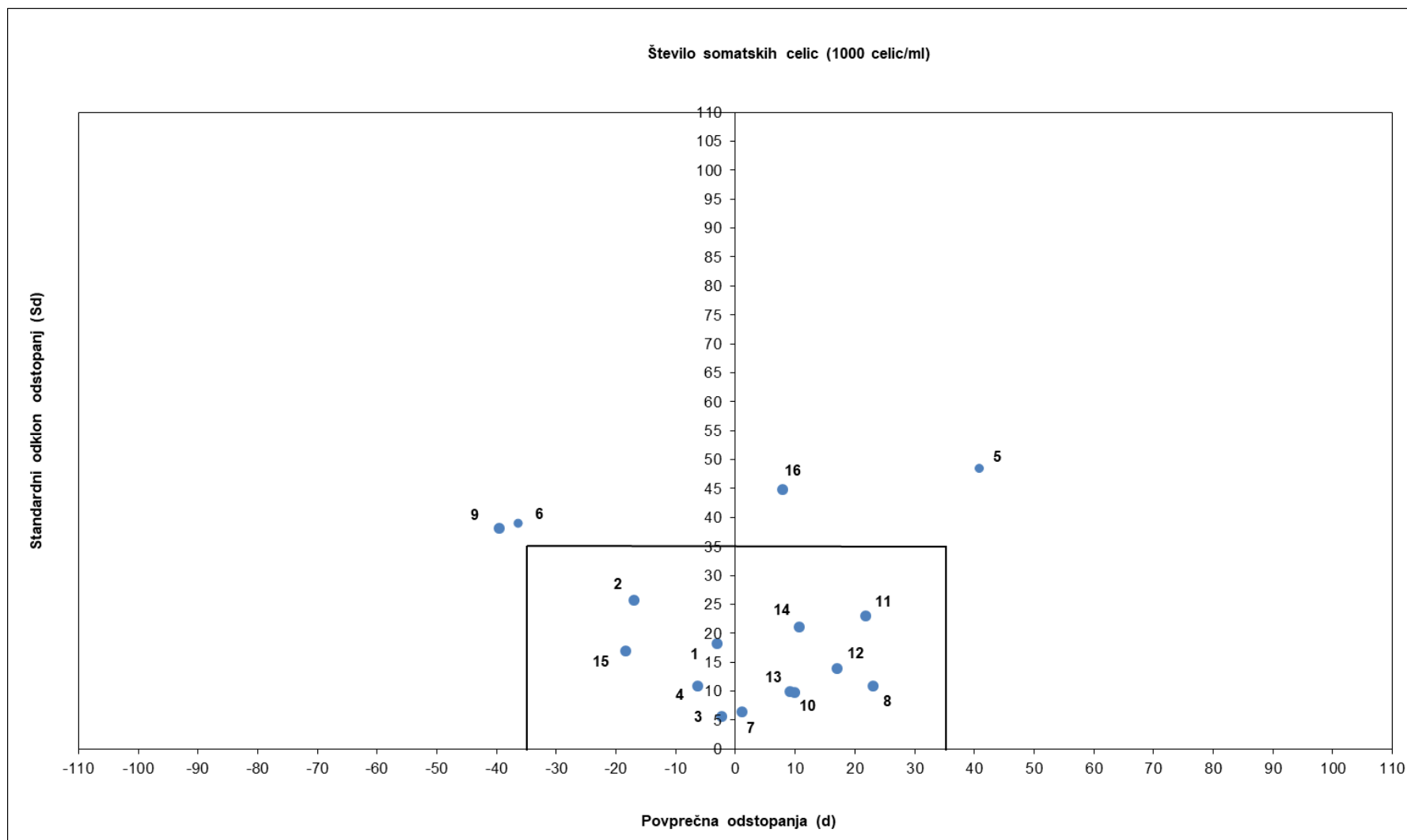
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Laboratory	Sample	1	2	3	4	5	d	Sd
15	Mean	157,00	1144,00	449,50	727,00	101,50		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	-8,45	-46,30	-8,63	-22,81	-6,13	-18,46	16,90
	Z-value	-0,70	-0,76	-0,36	-0,85	-0,92		

Laboratory	Sample	1	2	3	4	5	d	Sd
16	Mean	141,00	1248,00	410,00	795,00	117,00		
	REF	165,45	1190,30	458,13	749,81	107,63		
	S	12,15	60,78	23,77	26,89	6,63		
	Diff	-24,45	57,70	-48,13	45,19	9,37	7,94	44,88
	Z-value	-2,01	0,95	-2,02	1,68	1,41		

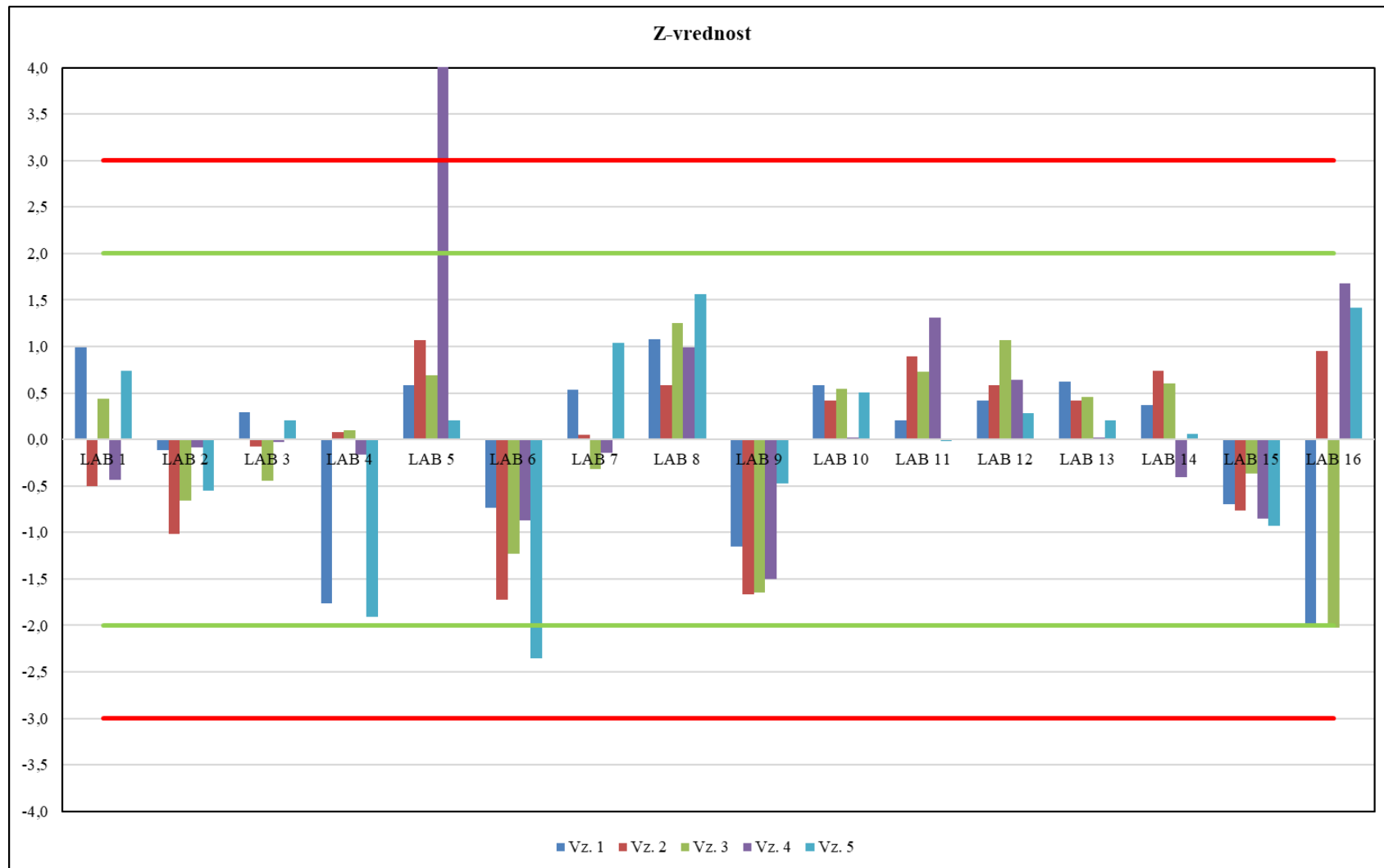
Limits: $d = \pm 35 \times 10^3$ cells/ml $Sd = 35 \times 10^3$ cells/ml

Figure 1: Accuracy (see Table 4)



Limits $d = \pm 35 \times 10^3$ cells/ml, $Sd = 35 \times 10^3$ 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