INŠTITUT ZA MLEKARSTVO IN PROBIOTIKE
INSTITUTE OF DAIRY SCIENCE & PROBIOTICS

PROFICIENCY TESTING

Urea

MARCH

2026

Dear Sir/Madam!

Thank you for participating in the proficiency testing MARCH 2026. 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: 7271-0326 for parameter UREA in milk and they are presented in the form of tables and graphs.

Table 1: Used statistics

$\boldsymbol{mean = \frac{\sum x_n}{N}}$	$povp$ = average sample value x_n = value of sample n N = number of samples
$\boldsymbol{diff = \bar{x}_n - ref}$	$diff$ = deviation of sample value from reference value $\bar{x}_n$ = avrage sample value ref = robust average sample value
$\boldsymbol{Z - value = \frac{\bar{x}_n - ref}{S}}$	$\bar{x}_n$ = 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
$\boldsymbol{d = \frac{\sum(\bar{x}_n - ref)}{N}}$	d = average of deviations x_n = value of sample n N = number of samples ref = robust average sample value
$\boldsymbol{Sd = \sqrt{\frac{\sum(\bar{x}_n - ref)^2}{N}}}$	Sd = standard deviation of deviations x_n = value of sample n N = number of samples ref = robust average sample value
$\boldsymbol{ref}$	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 (a=0,05)

Responsible for sample preparation and statistical analysis of results:
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Table 2: Outliers detection according to Grubbs method (a = 0,05)

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

Legend:
n = number of outliers

Table 4: Repeatability (g/100g)

	Sample (r)								
Laboratory	**1**	**2**	**3**	**4**	**5**	**6**	**7**	N	Sr
1	0,80	0,40	0,20	1,50	1,20	0,50	0,50	7	0,43
2	1,20	3,80	0,20	3,30	1,80	1,40	1,00	7	1,19
3	0,40	1,00	0,20	1,80	1,10	1,60	2,70	7	0,80
4	0,50	0,00	0,40	0,40	1,10	0,50	0,60	7	0,30
5	0,30	0,50	0,70	0,30	0,00	0,40	0,20	7	0,21
6	0,40	0,30	2,10	0,00	0,60	0,60	0,50	7	0,63
7	0,40	1,20	0,80	0,50	1,50	1,20	0,20	7	0,45
8	1,60	0,10	1,20	0,70	0,90	0,20	0,70	7	0,49
9	0,10	0,30	0,10	0,20	0,40	0,80	0,10	7	0,24
10	1,30	0,80	0,50	0,20	0,10	0,40	0,50	7	0,37
N	10	10	10	10	10	10	10		
Sr	0,50	1,11	0,62	1,03	0,59	0,48	0,75		

Legend:
r = repetability; absolute diffrerence between two measurments of the same sample
N = number of measurments
Sr = standard deviation of repeatability

Limits:
r = 1,5 mg/100 ml (ISO 14637/IDF 195:2004)
r = 3,9 mg/100 ml r = 2,8 × sr ; sr = 1,4 mg/100 ml (ISO 8196-3/IDF 128-3:2009)

Table 4: Repeatability (S_r) in reproducibility (S_R) (ISO 5725-2:2019)

	Vzorec						
	1	**2**	**3**	**4**	**5**	**6**	**7**
S_r (mg/100ml)	0,60	0,95	0,61	0,93	0,73	0,63	0,71
S_R (mg/100ml)	3,16	3,41	3,79	2,56	3,60	2,85	3,05

S_r (mg/100ml) proficiency testing	0,74
S_R mg/100ml) proficiency testing	3,20

Table 5: Accuracy (mg/100 ml)

Laboratory	Sample	1	2	3	4	5	6	7	d	Sd
1	Mean	21,00	31,50	44,40	21,85	60,20	20,65	29,55		
	REF	21,92	30,38	44,85	22,55	61,87	21,82	29,01		
	S	2,84	2,35	3,95	2,46	4,17	2,92	2,90		
	diff	-0,92	1,12	-0,45	-0,70	-1,67	-1,17	0,54	-0,46	0,98
	z-value	-0,33	0,48	-0,11	-0,29	-0,40	-0,40	0,19		

Laboratory	Sample	1	2	3	4	5	6	7	d	Sd
2	Mean	23,80	29,90	49,70	22,25	64,30	24,90	29,50		
	REF	21,92	30,38	44,85	22,55	61,87	21,82	29,01		
	S	2,84	2,35	3,95	2,46	4,17	2,92	2,90		
	diff	1,88	-0,48	4,85	-0,30	2,43	3,09	0,49	1,71	1,94
	z-value	0,66	-0,21	1,23	-0,12	0,58	1,06	0,17		

Laboratory	Sample	1	2	3	4	5	6	7	d	Sd
3	Mean	23,40	31,90	46,50	24,60	62,95	22,40	31,35		
	REF	21,92	30,38	44,85	22,55	61,87	21,82	29,01		
	S	2,84	2,35	3,95	2,46	4,17	2,92	2,90		
	diff	1,48	1,52	1,65	2,05	1,08	0,58	2,34	1,53	0,58
	z-value	0,52	0,65	0,42	0,83	0,26	0,20	0,81		

Laboratory	Sample	1	2	3	4	5	6	7	d	Sd
4	Mean	28,95	39,20	51,90	27,80	67,85	27,25	35,40		
	REF	21,92	30,38	44,85	22,55	61,87	21,82	29,01		
	S	2,84	2,35	3,95	2,46	4,17	2,92	2,90		
	diff	7,03	8,82	7,05	5,25	5,98	5,44	6,39	6,57	1,22
	z-value	2,48	3,76	1,79	2,14	1,44	1,86	2,20		

Laboratory	Sample	1	2	3	4	5	6	7	d	Sd
5	Mean	20,75	28,65	41,65	24,75	61,50	21,20	27,70		
	REF	21,92	30,38	44,85	22,55	61,87	21,82	29,01		
	S	2,84	2,35	3,95	2,46	4,17	2,92	2,90		
	diff	-1,17	-1,73	-3,20	2,20	-0,37	-0,62	-1,31	-0,89	1,64
	z-value	-0,41	-0,74	-0,81	0,89	-0,09	-0,21	-0,45		

Laboratory	Sample	1	2	3	4	5	6	7	d	Sd
6	Mean	25,20	33,55	47,15	22,50	65,60	24,70	31,85		
	REF	21,92	30,38	44,85	22,55	61,87	21,82	29,01		
	S	2,84	2,35	3,95	2,46	4,17	2,92	2,90		
	diff	3,28	3,17	2,30	-0,05	3,73	2,89	2,84	2,59	1,25
	z-value	1,16	1,35	0,58	-0,02	0,90	0,99	0,98		

Laboratory	Sample	1	2	3	4	5	6	7	d	Sd
7	Mean	19,40	30,50	43,50	21,85	61,45	19,90	28,00		
	REF	21,92	30,38	44,85	22,55	61,87	21,82	29,01		
	S	2,84	2,35	3,95	2,46	4,17	2,92	2,90		
	diff	-2,52	0,12	-1,35	-0,70	-0,42	-1,92	-1,01	-1,11	0,90
	z-value	-0,89	0,05	-0,34	-0,29	-0,10	-0,66	-0,35		

To be continued…

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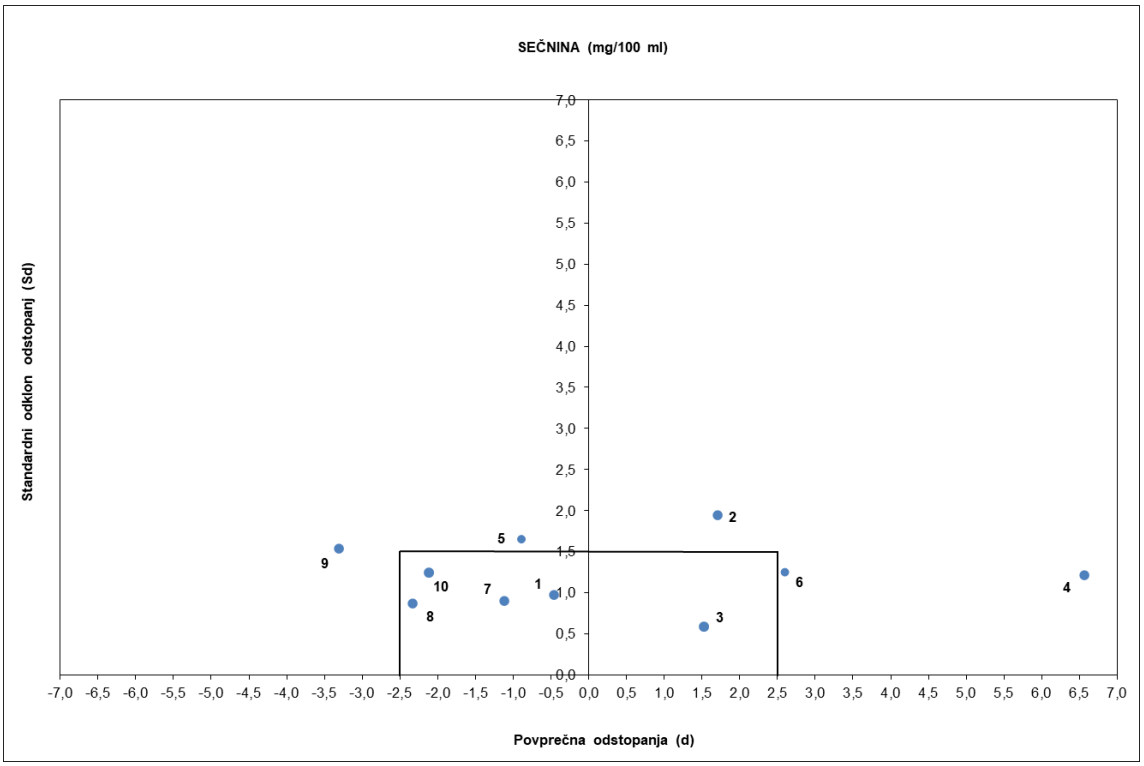
Laboratory	Sample	1	2	3	4	5	6	7	d	Sd
8	Mean	19,90	28,15	42,50	18,95	61,05	18,80	26,75		
	REF	21,92	30,38	44,85	22,55	61,87	21,82	29,01		
	S	2,84	2,35	3,95	2,46	4,17	2,92	2,90		
	diff	-2,02	-2,23	-2,35	-3,60	-0,82	-3,02	-2,26	-2,33	0,86
	z-value	-0,71	-0,95	-0,59	-1,47	-0,20	-1,03	-0,78		

Laboratory	Sample	1	2	3	4	5	6	7	d	Sd
9	Mean	18,95	28,15	40,25	20,50	55,90	20,10	25,35		
	REF	21,92	30,38	44,85	22,55	61,87	21,82	29,01		
	S	2,84	2,35	3,95	2,46	4,17	2,92	2,90		
	diff	-2,97	-2,23	-4,60	-2,05	-5,97	-1,72	-3,66	-3,31	1,54
	z-value	-1,05	-0,95	-1,16	-0,84	-1,43	-0,59	-1,26		

Laboratory	Sample	1	2	3	4	5	6	7	d	Sd
10	Mean	20,65	29,40	42,05	21,90	57,65	19,30	26,65		
	REF	21,92	30,38	44,85	22,55	61,87	21,82	29,01		
	S	2,84	2,35	3,95	2,46	4,17	2,92	2,90		
	diff	-1,27	-0,98	-2,80	-0,65	-4,22	-2,52	-2,36	-2,11	1,24
	z-value	-0,45	-0,42	-0,71	-0,27	-1,01	-0,86	-0,81		

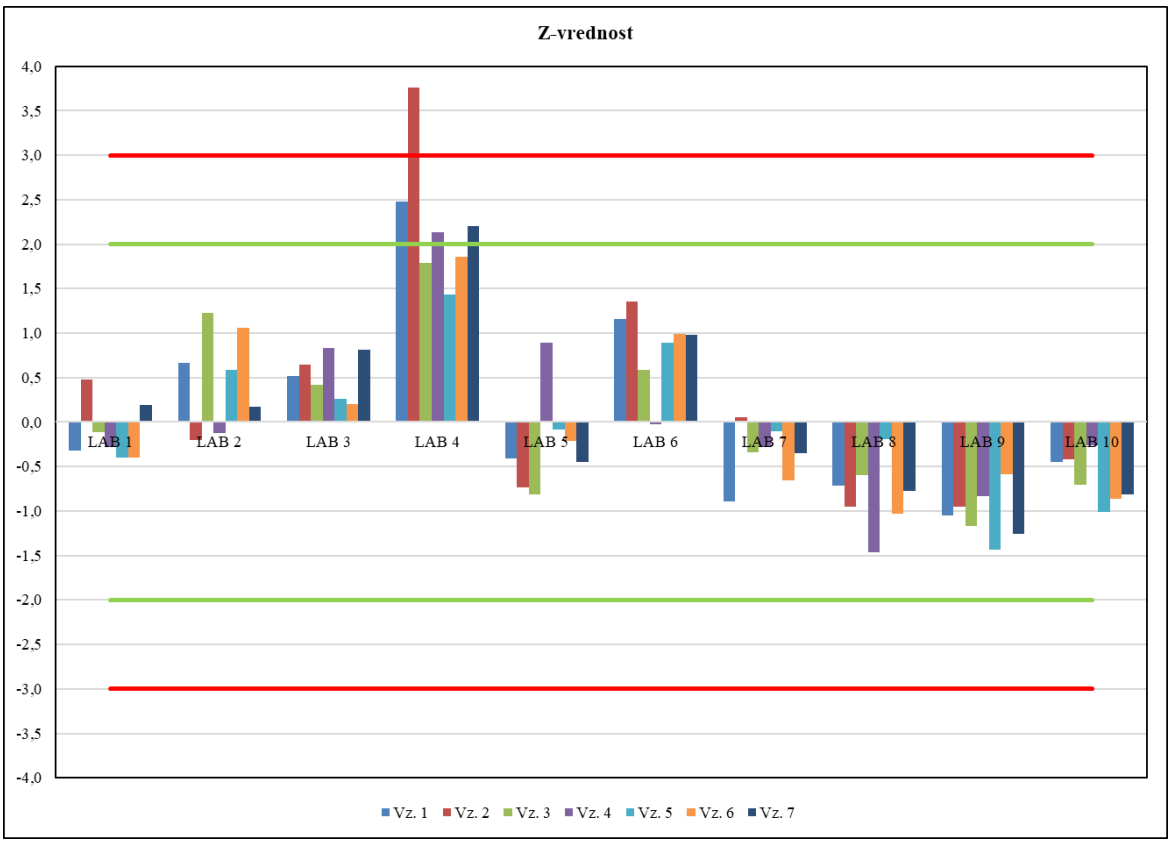
Limits: d = ± 2,50 mg/100 ml Sd = 1,50 mg/100 ml

Figure 1: Accuracy (see Table 5)



Limits: d = ± 2,50 mg/100 ml, Sd = 1,50 mg/100 ml

Figure 2: Z-value (see Table 5)



Limits: $|Z| \leq 2{,}00$ satisfactoy $2{,}00 < |Z| < 3{,}00$ questionable $|Z| \geq 3{,}00$ unsatisfactory