THE GLOBAL STANDARD
FOR LIVESTOCK DATA

ICAR PROFICIENCY TEST - MARCH 2023

Raw cow milk

"Reference" Methods

FRAME OF ACTIVITY :

ICAR MILK ANALYSES SUB-COMMITTEE (MA SC)

Raw cow milk

"Reference" Methods

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1. Introduction

Dear Participant,

Thank you for participating in the ICAR Proficiency Test (PT) March 2023 !

This is the fifteenth round that ICAR organized since 2016 !!!

The sample preparation and statistical elaboration have been done by ICAR with Sub- contractor Actalia, accreditated for ISO 17043.

The synthetic report and control charts over the time are prepared by ICAR.

The advantage to participate in the PT round is to obtain a worldwide updated picture of the analytical situation for milk analyses.

For somatic cell parameter, since March 2020 we have the possibility to build the international traceability to the EC JRC Certified reference material for somatic cell counting in milk. Following the ISO/IDF Bullettin 508/2021 Guidance and application of EC JRC Certified reference material for somatic cell counting in milk we have characterized the ICAR PT samples These values and the ISO 13366-2 standard deviation of reproducibility, will be used to calculate, for **SCC ZScore FIX.** In this way the ZS FIX will better anchored to the international metrological traceability and you can follow your instrument performance over the time.

In this report you will find sections 2 and 3 which are dedicated to "your" quality assurance management and section 4 dedicated to the "general" statistical elaboration for each parameter.

The proficiency test is a tool to help evaluate the performance of the laboratory process and to support your laboratory quality assurance system. It's aim is to provide independent data for you to monitor, evaluate and ultimately improve your processes as you see fit.

From the analyses of the data received we have identified some aspects that if evaluated and managed may serve to improve some control steps of your quality management ISO 17025.

When the PT samples arrive to your laboratory they can be viewed as being from a 'customer' that is asking you to provide timely, precise and accurate results.

In tables A,B,C,D,E,F,G if the information is reported correctly from the participant, then the cells are filled in green, otherwise they are highlighted in red for your attention, so you can review and verify any causal reasons internally. The control charts, will help you to follow your performance over the time.

A)   In table A you find your participation codes, for each parameter, and the information if all the results from the samples received, have been sent to the PT provider.

B)   In table B is indicated if the results have been sent on time.

C) In table C is indicated if the results have been reported in the correct unit of measurements.

D) It is the ranking of your laboratory. The values of table 1 for each parameter are reported. In table F the ranking of your lab will be green if the mean of difference and standard deviation of difference value are in the box of figure 2 of each parameter. Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation. ICAR Milk Analyses Sub Committee is monitoring these limits and eventually will update the limit of the box to evaluate the accuracy.

E) Here are reported the samples that resulted outlier for your participation code for Cochran and/or Grubbs test

F) The evaluation of repeatability of the results should be one of the first controls before communication of the data. In table F the absolute difference between replicates is compared with the repeatability limit of the relevant "reference" method indicated. If one or more results have a result out of the limit, the cell is in red. It may be that you have deployed a chemical method that is different from the reference method indicated. If the repeatability is bigger it will be evaluated internally with the precision of the specific method used. You can find all the detailed information of your data in Table II in the section Statistical elaboration for each parameter.

G) In table G the results of your Z-Score$_{PT}$ (standard deviation calculated on this proficiency test) and the Z-Score$_{FIX}$ (standard deviation of the standard method) are summarized.

Z-Score$_{FIX}$ is calculated considering the standard deviation of reproducibility of the standardized method

If you have obtained all the -2<Z-Score results<+2 the cell will be filled in green. If you have obtained one or more results in the moderate or poor performance range the cells will be filled in yellow or red respectively.

Control Charts and tables

On the control charts are reported the last 3 proficiency tests where your lab participated

In the associated table are reported all the ZS-PT and ZS Fix where your laboratory participated

For this reason from this round the ZS values are reported according the sample order from 1 to 10 and not according the sample concentration as organized in the previous PT

In the second part of the report the statistical elaboration followed the template approved by ICAR's Milk Analyses Sub Committee. You find the statistical elaboration for all the ICAR interested parameters, fat, protein, lactose, urea and somatic cell.

We think it is important to show you, as ICAR member, the reproducibility of the ICAR laboratories, even if you have not participated in this PT round.

For each parameter the **SR=standard deviation of reproducibility** has been calculated after the outlier elimination. If you have participated, and your results are in the repeatability limits, you can use this value for the calculation of your uncertainty of measurement.

ICAR would like to see, in the next years, part 4 of this report, completed with the results, reference and/or routine methods, from all the ICAR countries for the parameters indicated.

We are sure with your support and contribution it will grow to benefit all!

The list of laboratories that participated in ICAR PT March 2023 with at least one parameter is reported below

Table 1. Participating milk laboratories to the ICAR Proficiency Test (March 2023)

Country	Laboratory
Austria	Pruefstelle Labor Rotholz
Belgium	Comite du Lait ASBL
Belgium	Department of Agricultural products of Walloon Agricultural Research Centre
Canada	Lactanet
Czech Rep.	Laborator pro rozbor mleka Brno, Ceskomoravská spolecnost chovatelu a.s.
Czech Rep.	MILCOM a.s Dairy Research Institute
Denmark	Eurofins Milk Testing Denmark
Denmark	Foss Analytical A/S
Denmark	LVK
Estonia	Eesti Pollumajandusloomade Joudluskontrolli AS, Milk Analysing Laboratory
Finland	Valio Oy, Regional laboratory
France	ACTALIA / ACTILAIT / CECALAIT
France	TermoFisher Scientific Lab Service Intern.
Germany	Milchprüfring Bayern e.V.
Hungary	Hrvatska Agencija za poljoprivredu i hranu
Israel	Central Milk Laboratory – ICBA
Italy	Associazione Italiana Allevatori, Laboratorio Standard Latte (LSL-AIA)
Italy	Federazione Latterie Alto Adige Soc. Agr. Coop.
Japan	Japan Dairy Technical Association
Kazakistan	Test center LLP
Norway	Tine Ramelklaboratoriet Heimdal
Norway	Tine SA Mastittlaboratoriet i Molde
Poland	Laboratorium Oceny Mleka (KCHZ), Laboratorium Referencyjne z siedziba w Parzniewie
Poland	PFHBiPM Laboratorium w Bialymstoku zs.w Jezewie Starym
Poland	PFHBiPM Laboratorium w Kobiernie
Poland	PFHBiPM Laboratorium w Parzniewie
Poland	PFHBiPM Region Oceny Bydgoszcz z/s w Minikowie
Portugal	Associação Interprofissional do Leite e Lacticínios
Portugal	LRV-LABORATORIO REGIONAL DE VETERINARIA
Portugal	Sercla Sao Miguel
Portugal	Sercla Terceira
Serbia	Laboratorija za ispitivanje kvaliteta mleka, Poljoprivredni fakultet Novi Sad
Slovakia	Plemenárske služby SR, š.p., Centrálne laboratórium rozboru mlieka
Slovenia	KGZS Zavod Ptui

Country	Laboratory
Slovenia	University of Ljubljana, Biotechnical Faculty, Department of Animal Science, Institute of Dairy Science and Probiotics
Slovenia	Veterinary faculty NVI U Kranj
South Africa	Mérieux NutriSciences Cape Town
South Korea	Korea Animal Improvement Association
Spain	CICAP
Sweden	DeLaval International AB
Sweden	Eurofins Milk Testing Sweden AB
Switzerland	Agroscope
Switzerland	Suisselab AG
Taiwan	Council of Agriculture, Executive Yuan, Taiwan Animal Germplasm Center of TLRI
The Netherlands	Qlip B.V.
Tunisia	Laboratoire d Analse du lait Beja
Tunisia	Office de l'Elevage et des Pasturages, Laboratoire de Controle Laitier
UK	CIS
UK	National Milk Records plc_ Glasgow
UK	National Milk Records plc_ Wolverhampton
USA	Eastern Laboratory Services

ICAR Proficiency Test (PT) Chemical "Reference" methods –March 2023
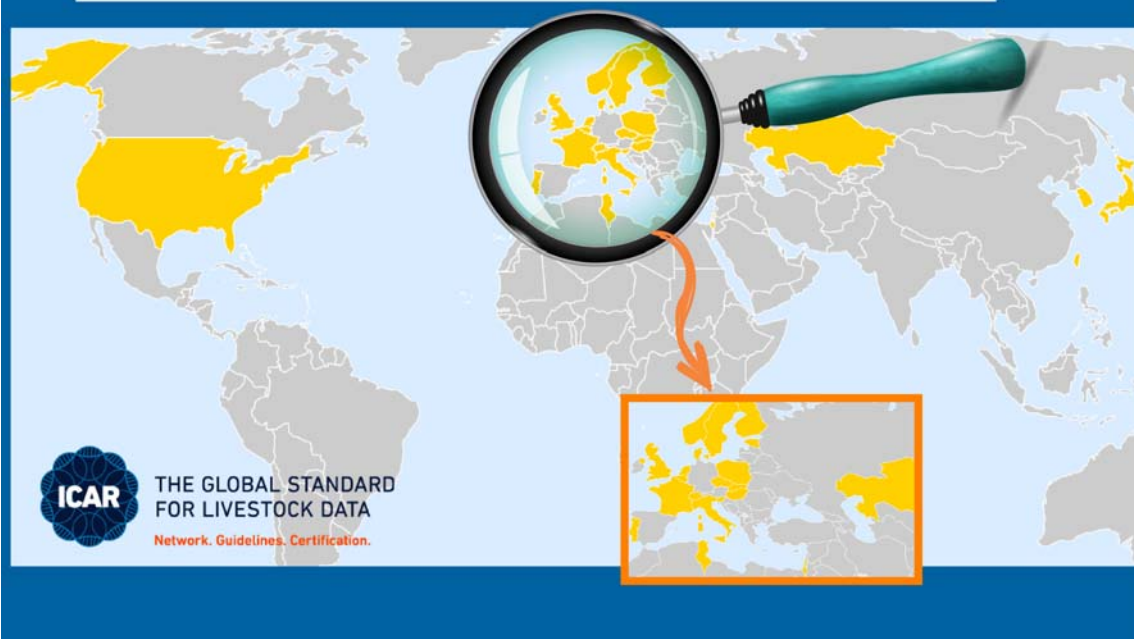
ICAR would like to stay at your side to support you in any way we can to help improve overall quality management systems for milk analyses. Your active participation in the ICAR PTs and in the Milk Analyses meetings is encouraging. We welcome any and all feedback/comments you may have on this activity, as it will help us continuously improve and to ultimately provide you a better service.

Kind Regards,

ICAR Secretariat

Chemical Reference Methods
Laboratory participation codes and Performance analyses

ICAR PT RF0323

Laboratory Name	

A — Your participation Codes

		Fat ref	Protein ref	Lactose ref	Urea ref	SCC ref/alt
A	Subscription	Yes	Yes	Yes	Yes	Yes
	Participation Codes	2	2	1	2	3
	Are all the sample results received?	Yes	No	Yes	Yes	Yes

B — Data results received on time

		Fat ref	Protein ref	Lactose ref	Urea ref	SCC ref/alt
B	Results reception date	23/03/2023	23/03/2023	17/03/2023	15/03/2023	16/03/2023

C — Have you sent the data with the correct units of measurements?

		Fat ref	Protein ref	Lactose ref	Urea ref	SCC ref/alt
C		g/100g	nitrogen g/100g *	g/100g	mg/dl	SCC*1000/ml
		Yes	Yes	Yes	Yes	Yes
	*It was requested to report the value in total nitrogen					

D — Ranking of your lab

		Fat ref	Protein ref	Lactose ref	Urea ref	SCC ref/alt
D		g/100g	nitrogen g/100g *	g/100g	mg/dl	SCC*1000/ml
	Code	2	2	1	2	3
	%	50	100	100	22	71
	d	-0.012	0.008	0.029	-0.513	6%
	Sd	0.004	0.536	0.184	0.410	6%
	D	0.012	0.537	0.186	0.657	8%
	Limits					
	d	<= 0.020	<= 0.025	<= 0.10	-2.5 <= d <= 2.5	-10% <= d <= 10%
	Sd	<= 0.030	<= 0.020	<= 0.10	<= 1.5	<= 10%

E — Outliers

		Fat ref	Protein ref	Lactose ref	Urea ref	SCC ref/alt
E		g/100g	nitrogen g/100g *	g/100g	mg/dl	SCC*1000/ml
	Sample 1		Outlier			
	Sample 2		Outlier			
	Sample 3					
	Sample 4					
	Sample 5			Outlier		
	Sample 6					
	Sample 7					
	Sample 8			Outlier		
	Sample 9					
	Sample 10					

F

Repeatability

Your "r" performance

	Fat ref	Protein ref	Lactose ref	Urea ref	SCC ref/alt
	g/100g	nitrogen g/100g *	g/100g	mg/dl	SCC*1000/ml
Sample 1	0.009	0.001	0.00	0.40	11
Sample 2	0.007	0.000	0.01	0.37	7
Sample 3	0.007	0.003	0.00	0.06	4
Sample 4	0.006	0.002	0.01	0.15	8
Sample 5	0.012	0.002	0.00	0.06	5
Sample 6	0.014	0.001	0.01	0.00	12
Sample 7	0.009	0.003	0.00	0.05	10
Sample 8	0.006	0.000	0.02	0.83	17
Sample 9	0.005	0.000	0.01	0.31	0
Sample 10	0.016	0.005	0.00	0.15	9

If the repeatability in smaller than the limit the cell is in green if there is a sample with a "r" bigger than the limit the cell is in red. Please check table II in correspondence of the parameter and your lab code.

Limits

	Fat ref	Protein ref	Lactose ref	Urea ref	SCC ref/alt	
	g/100g	nitrogen g/100g *	g/100g	mg/dl	SCC*1000/ml	
	ISO 1211 IDF 1D	ISO 8968 IDF 20	ISO 22662 IDF 198	ISO 14637 IDF 195	ISO 13366-2 IDF 148-2	
	<= 0.043	<= 0.038	<= 0.06	<= 1.52	Level	r
					150	25
					300	42
					450	51
					750	64
					1500	126

G

Your Z-Score PT

	Fat ref	Protein ref	Lactose ref	Urea ref	SCC ref/alt
Sample 1	-0.21	-56.20	0.32	0.55	1.30
Sample 2	-1.40	75.75	0.22	-0.58	0.26
Sample 3	-0.96	0.47	-0.05	-0.70	0.68
Sample 4	-0.85	0.30	0.29	-0.55	0.91
Sample 5	-0.69	0.62	-4.54	-0.03	1.49
Sample 6	-1.18	0.31	0.10	-0.41	1.23
Sample 7	-0.68	0.44	0.07	-0.62	1.25
Sample 8	-2.31	-0.05	12.18	-0.38	0.61
Sample 9	-0.88	0.00	-0.16	-0.47	-0.23
Sample 10	-0.75	0.45	-0.12	-0.07	0.25

Your Z-Score Fix

	Fat ref	Protein ref	Lactose ref	Urea ref	SCC ref/alt
Sample 1	-0.21	-59.07	0.41	0.12	1.74
Sample 2	-0.48	60.14	0.28	-0.38	0.63
Sample 3	-0.62	0.59	-0.06	-0.48	0.99
Sample 4	-0.43	0.24	0.37	-0.33	0.89
Sample 5	-0.73	0.85	-5.23	-0.01	1.48
Sample 6	-0.38	0.13	0.08	-0.46	1.73
Sample 7	-0.70	0.58	0.07	-0.21	1.52
Sample 8	-0.77	-0.06	10.66	-0.47	1.03
Sample 9	-0.58	0.00	-0.23	-0.53	1.24
Sample 10	-0.93	0.64	-0.13	-0.09	0.93

If there is a sample with a "z-score" in the yellow or red area please check table VI and VII in correspondence of your lab code.

Interpretation Z-Score

Z-Score < -3	-3 <= Z-Score < -2	-2 <= Z-Score <= 2	2 < Z-Score <= 3	Z-Score > 3
Poor	Moderate	Good	Moderate	Poor

ZSCORE-PT - FAT reference
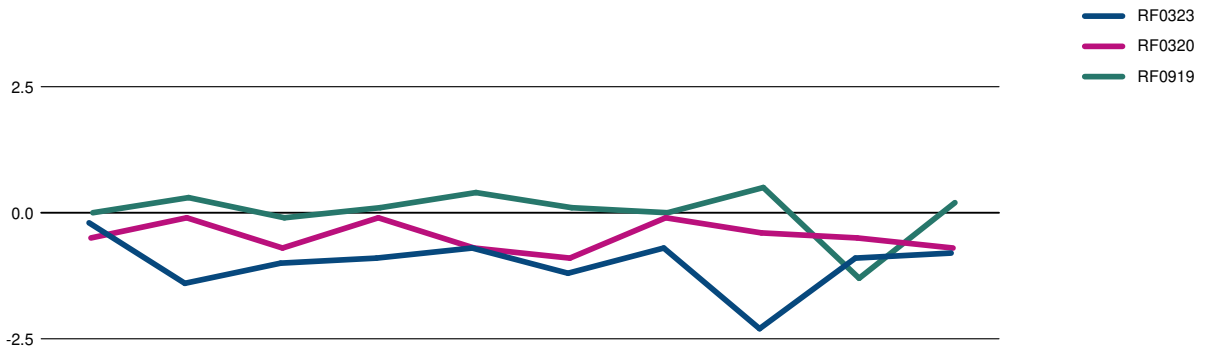
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
2	RF0323	-0.2	-1.4	-1.0	-0.9	-0.7	-1.2	-0.7	-2.3	-0.9	-0.8	10%	0%	90%
2	RF0320	-0.5	-0.1	-0.7	-0.1	-0.7	-0.9	-0.1	-0.4	-0.5	-0.7	0%	0%	100%
1	RF0919	0.0	0.3	-0.1	0.1	0.4	0.1	0.0	0.5	-1.3	0.2	0%	0%	100%
2	RF0319	0.1	-1.9	-1.1	-0.1	0.2	0.1	-0.9	-2.3	-0.1	-1.0	10%	0%	90%
2	RF0918	0.6	0.7	0.5	-1.6	-0.6	0.6	-0.2	-0.2	-1.2	-0.6	0%	0%	100%
2	RF0318	-0.2	0.2	-0.1	0.3	0.2	0.2	0.0	-1.9	-0.4	0.1	0%	0%	100%
2	RF0917	0.0	0.3	-0.4	0.0	0.8	0.0	-0.2	0.0	-0.1	0.7	0%	0%	100%
2	RF0317	0.3	-0.3	0.3	0.6	1.0	0.3	0.5	0.6	1.6	0.6	0%	0%	100%
2	RF0916	0.7	0.8	0.8	0.7	0.7	0.2	0.8	0.6	0.1	0.7	0%	0%	100%
2	RF0316	-0.1	-0.4	-0.1	0.1	0.0	-0.3	0.5	0.1	0.0	0.5	0%	0%	100%

ZSCORE-FIX - FAT reference
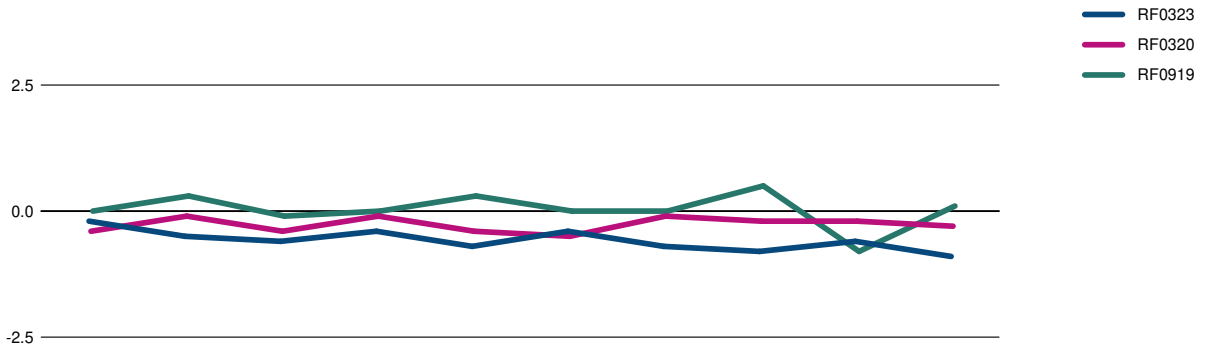
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
2	RF0323	-0.2	-0.5	-0.6	-0.4	-0.7	-0.4	-0.7	-0.8	-0.6	-0.9	0%	0%	100%
2	RF0320	-0.4	-0.1	-0.4	-0.1	-0.4	-0.5	-0.1	-0.2	-0.2	-0.3	0%	0%	100%
1	RF0919	0.0	0.3	-0.1	0.0	0.3	0.0	0.0	0.5	-0.8	0.1	0%	0%	100%
2	RF0319	0.1	-1.2	-0.5	-0.1	0.1	0.1	-0.4	-1.5	0.0	-0.3	0%	0%	100%
2	RF0918	0.6	0.5	0.3	-2.1	-0.4	0.5	-0.1	-0.2	-1.1	-0.6	10%	0%	90%
2	RF0318	-0.2	0.2	-0.1	0.4	0.2	0.2	0.1	-1.1	-0.3	0.1	0%	0%	100%
2	RF0917	0.0	0.4	-0.1	0.0	0.4	0.0	-0.1	0.0	0.0	0.6	0%	0%	100%
2	RF0317	0.3	-0.1	0.2	0.4	0.6	0.2	0.4	0.5	0.6	0.2	0%	0%	100%
2	RF0916	0.3	0.3	0.5	0.5	0.6	0.1	0.4	0.4	0.1	0.5	0%	0%	100%
2	RF0316	-0.1	-0.3	-0.1	0.1	0.0	-0.1	0.4	0.0	0.0	0.6	0%	0%	100%

ZSCORE-PT - PROTEIN reference
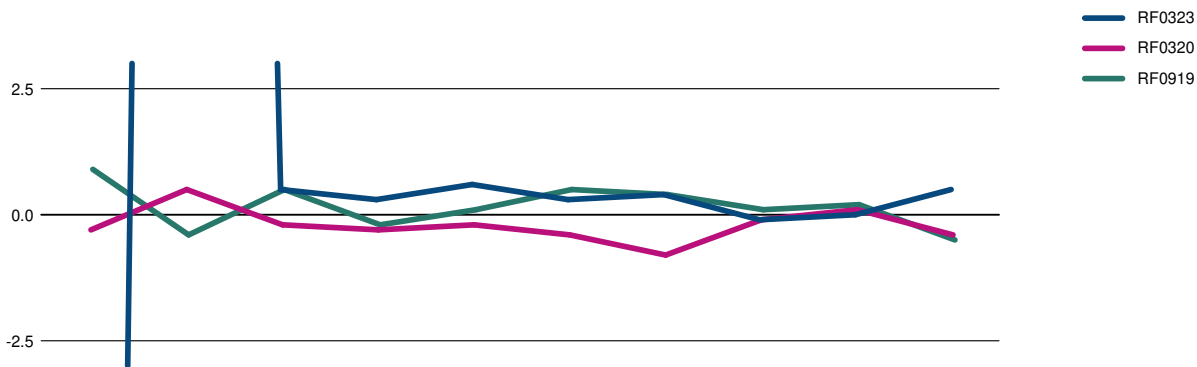
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
2	RF0323	-56.2	75.8	0.5	0.3	0.6	0.3	0.4	-0.1	0.0	0.5	0%	20%	80%
2	RF0320	-0.3	0.5	-0.2	-0.3	-0.2	-0.4	-0.8	-0.1	0.1	-0.4	0%	0%	100%
1	RF0919	0.9	-0.4	0.5	-0.2	0.1	0.5	0.4	0.1	0.2	-0.5	0%	0%	100%
2	RF0319	-0.2	-1.1	-0.4	-0.1	-0.5	-0.3	0.2	-0.4	-0.1	0.0	0%	0%	100%
2	RF0918	-0.4	-0.5	0.2	-0.3	-0.3	0.2	0.0	-0.2	0.2	0.0	0%	0%	100%
2	RF0318	0.3	0.6	0.6	-0.1	0.0	0.2	-0.1	0.7	0.0	0.6	0%	0%	100%
2	RF0917	0.1	0.2	-0.1	-0.1	-0.2	0.5	0.6	0.0	0.2	-0.3	0%	0%	100%
2	RF0317	0.7	-0.3	0.7	-0.2	-0.2	-0.9	0.4	0.3	0.2	-0.3	0%	0%	100%
2	RF0916	-0.9	-0.3	-0.6	-1.0	-0.9	-1.3	-1.3	-1.1	-2.0	-0.9	0%	0%	100%
2	RF0316	0.6	0.2	0.2	0.4	0.3	-0.3	0.3	-0.6	0.1	-0.4	0%	0%	100%

ZSCORE-FIX - PROTEIN reference
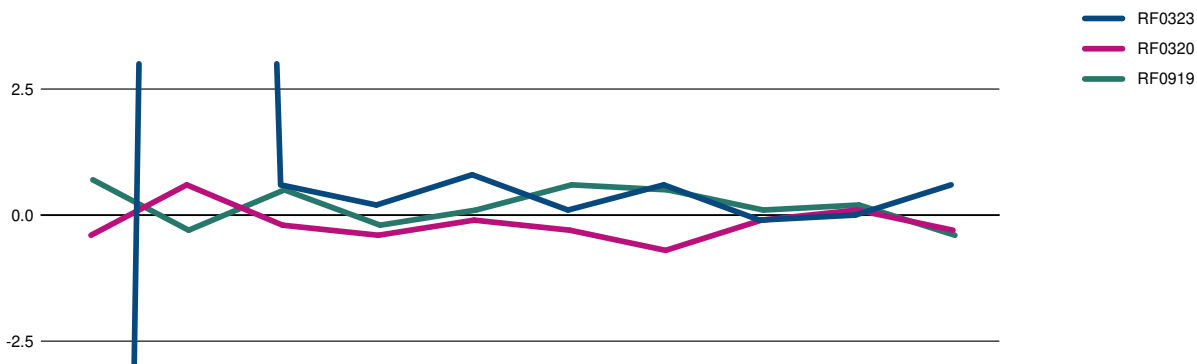
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2	RF0323	-59.1	60.1	0.6	0.2	0.8	0.1	0.6	-0.1	0.0	0.6	0%	20%	80%
2	RF0320	-0.4	0.6	-0.2	-0.4	-0.1	-0.3	-0.7	-0.1	0.1	-0.3	0%	0%	100%
1	RF0919	0.7	-0.3	0.5	-0.2	0.1	0.6	0.5	0.1	0.2	-0.4	0%	0%	100%
2	RF0319	-0.2	-1.5	-0.4	-0.1	-0.6	-0.5	0.2	-0.5	-0.2	0.0	0%	0%	100%
2	RF0918	-0.4	-0.3	0.2	-0.5	-0.5	0.2	0.0	-0.2	0.2	0.0	0%	0%	100%
2	RF0318	0.3	0.8	0.7	-0.2	0.1	0.5	-0.1	0.7	0.0	0.7	0%	0%	100%
2	RF0917	0.2	0.2	-0.1	-0.1	-0.2	0.5	0.5	0.0	0.4	-0.3	0%	0%	100%
2	RF0317	0.6	-0.3	0.7	-0.2	-0.2	-0.8	0.5	0.2	0.2	-0.3	0%	0%	100%
2	RF0916	-0.8	-0.3	-0.7	-0.9	-1.0	-1.5	-0.9	-0.8	-2.0	-1.1	0%	0%	100%
2	RF0316	0.6	0.2	0.2	0.5	0.4	-0.4	0.3	-0.5	0.1	-0.6	0%	0%	100%

ZSCORE-PT - LACTOSE reference
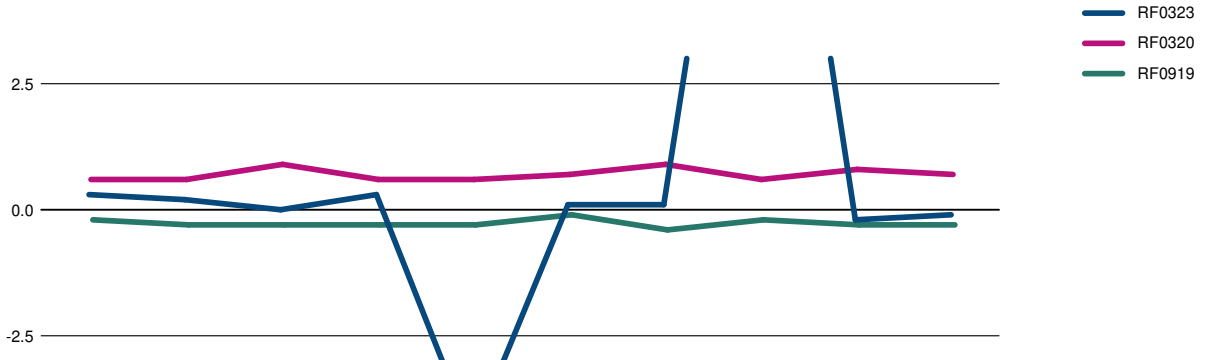
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
1	RF0323	0.3	0.2	0.0	0.3	-4.5	0.1	0.1	12.2	-0.2	-0.1	0%	20%	80%
1	RF0320	0.6	0.6	0.9	0.6	0.6	0.7	0.9	0.6	0.8	0.7	0%	0%	100%
1	RF0919	-0.2	-0.3	-0.3	-0.3	-0.3	-0.1	-0.4	-0.2	-0.3	-0.3	0%	0%	100%
1	RF0319	-0.6	-0.4	-0.6	-0.3	0.1	-0.3	-0.4	-0.3	0.2	0.0	0%	0%	100%
2	RF0918	0.4	0.3	0.0	-0.2	0.1	0.0	-0.1	0.2	-0.2	0.1	0%	0%	100%
1	RF0318	-0.1	-0.3	-0.1	-0.2	0.2	-0.1	-0.1	-0.3	-0.1	0.0	0%	0%	100%
1	RF0917	-0.4	-0.3	-0.7	-0.8	-0.5	-0.4	-0.4	-0.3	-0.4	-0.1	0%	0%	100%
2	RF0317	-0.2	-0.2	-0.3	-0.1	-0.4	-0.3	-0.3	-0.4	-0.5	-0.5	0%	0%	100%
2	RF0916	0.0	-0.2	0.0	0.0	0.1	-0.4	-0.1	0.3	0.0	-0.2	0%	0%	100%
1	RF0316	0.5	0.6	0.1	0.3	0.1	-0.1	0.2	0.5	0.2	0.4	0%	0%	100%

ZSCORE-FIX - LACTOSE reference
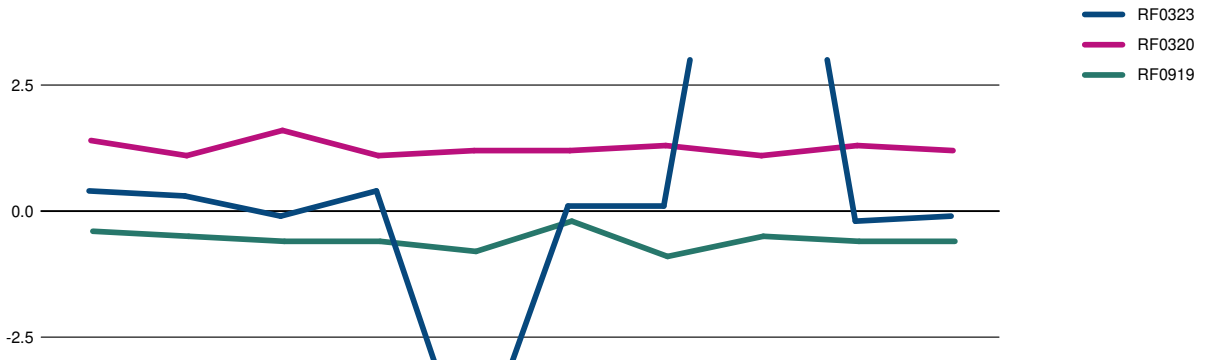
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
1	RF0323	0.4	0.3	-0.1	0.4	-5.2	0.1	0.1	10.7	-0.2	-0.1	0%	20%	80%
1	RF0320	1.4	1.1	1.6	1.1	1.2	1.2	1.3	1.1	1.3	1.2	0%	0%	100%
1	RF0919	-0.4	-0.5	-0.6	-0.6	-0.8	-0.2	-0.9	-0.5	-0.6	-0.6	0%	0%	100%
1	RF0319	-0.5	-0.4	-0.9	-0.4	0.1	-0.4	-0.5	-0.5	0.2	0.0	0%	0%	100%
2	RF0918	0.6	0.4	0.0	-0.2	0.1	0.0	-0.1	0.3	-0.2	0.1	0%	0%	100%
1	RF0318	-0.1	-0.2	-0.1	-0.3	0.2	-0.1	-0.1	-0.4	-0.1	0.0	0%	0%	100%
1	RF0917	-0.5	-0.8	-1.4	-1.1	-1.3	-0.7	-0.6	-0.8	-0.7	-0.1	0%	0%	100%
2	RF0317	-0.3	-0.4	-0.4	-0.2	-0.6	-0.4	-0.5	-0.6	-0.6	-1.1	0%	0%	100%
2	RF0916	0.0	-0.3	-0.1	0.0	0.1	-0.7	-0.1	0.4	0.0	-0.3	0%	0%	100%
1	RF0316	0.4	0.5	0.1	0.3	0.1	-0.1	0.2	0.5	0.3	0.5	0%	0%	100%

ZSCORE-PT - UREA reference
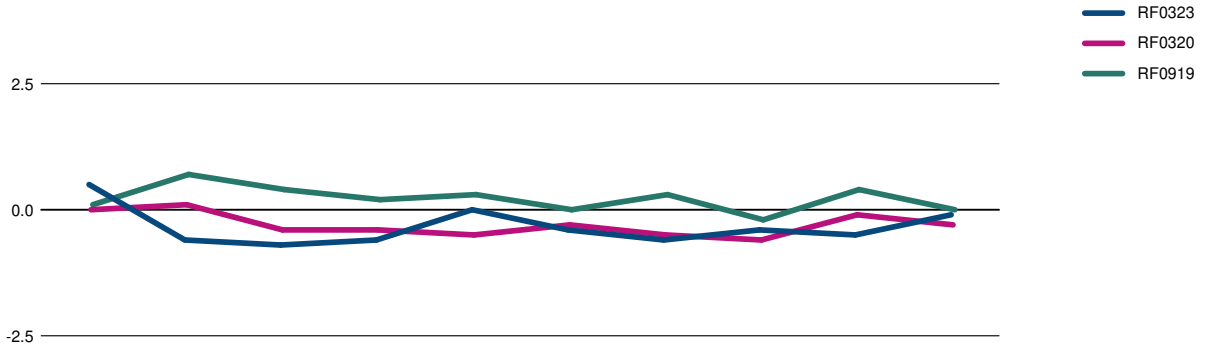
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
2	RF0323	0.5	-0.6	-0.7	-0.6	0.0	-0.4	-0.6	-0.4	-0.5	-0.1	0%	0%	100%
2	RF0320	0.0	0.1	-0.4	-0.4	-0.5	-0.3	-0.5	-0.6	-0.1	-0.3	0%	0%	100%
1	RF0919	0.1	0.7	0.4	0.2	0.3	0.0	0.3	-0.2	0.4	0.0	0%	0%	100%
2	RF0319	-0.1	0.0	-0.1	0.2	0.0	0.1	0.0	0.4	0.2	0.3	0%	0%	100%
2	RF0918	0.3	-0.5	-0.6	-0.7	-0.3	-0.8	0.6	0.9	-0.3	0.0	0%	0%	100%
1	RF0318	0.9	1.5	1.2	1.0	1.8	1.6	2.1	0.7	1.5	1.4	10%	0%	90%
1	RF0917	-1.3	-1.5	-1.6	-1.2	-1.8	-1.1	-2.1	-1.5	-1.9	-4.0	10%	10%	80%
2	RF0317	-5.1	0.2	0.3	-0.1	-0.1	-0.3	0.0	1.3	0.5	-0.1	0%	10%	90%
2	RF0916	0.2	0.2	-0.1	0.0	0.0	0.5	0.3	-0.1	0.1	0.2	0%	0%	100%
2	RF0316	0.3	-0.1	-0.1	0.0	0.6	0.8	1.1	2.2	0.3	0.2	10%	0%	90%

ZSCORE-FIX - UREA reference
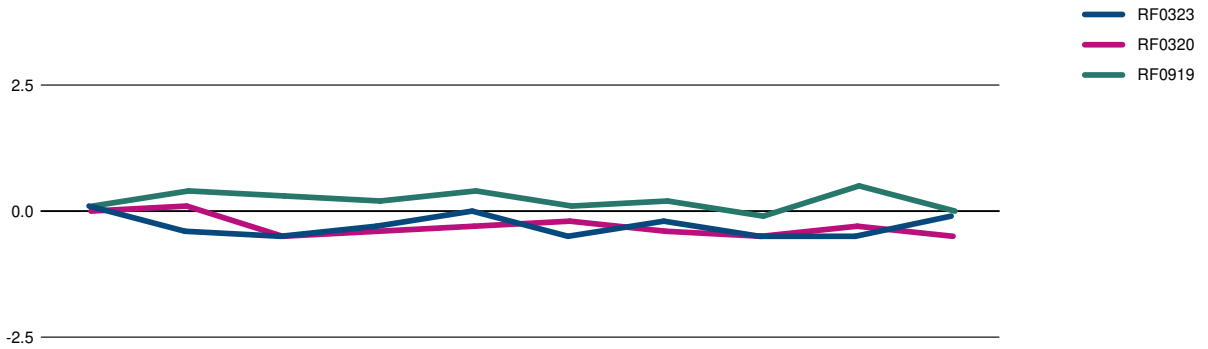
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
2	RF0323	0.1	-0.4	-0.5	-0.3	0.0	-0.5	-0.2	-0.5	-0.5	-0.1	0%	0%	100%
2	RF0320	0.0	0.1	-0.5	-0.4	-0.3	-0.2	-0.4	-0.5	-0.3	-0.5	0%	0%	100%
1	RF0919	0.1	0.4	0.3	0.2	0.4	0.1	0.2	-0.1	0.5	0.0	0%	0%	100%
2	RF0319	-0.1	0.1	-0.1	0.2	0.1	0.2	0.0	0.9	0.4	0.6	0%	0%	100%
2	RF0918	0.1	-0.2	-0.5	-0.2	0.0	-0.6	0.1	0.3	-0.4	-0.1	0%	0%	100%
1	RF0318	0.9	1.3	1.1	0.6	1.2	1.4	1.4	0.7	1.0	1.4	0%	0%	100%
1	RF0917	-0.8	-0.8	-0.8	-1.1	-1.0	-0.9	-0.9	-1.1	-0.7	-1.3	0%	0%	100%
2	RF0317	-3.7	0.2	0.2	-0.7	-0.1	-0.2	0.0	1.1	0.5	-0.1	0%	10%	90%
2	RF0916	0.2	0.2	-0.1	0.0	0.0	0.4	0.2	-0.1	0.0	0.1	0%	0%	100%
2	RF0316	0.2	0.0	0.0	0.0	0.4	0.6	0.5	2.8	0.3	0.2	10%	0%	90%

ZSCORE-PT - SCC
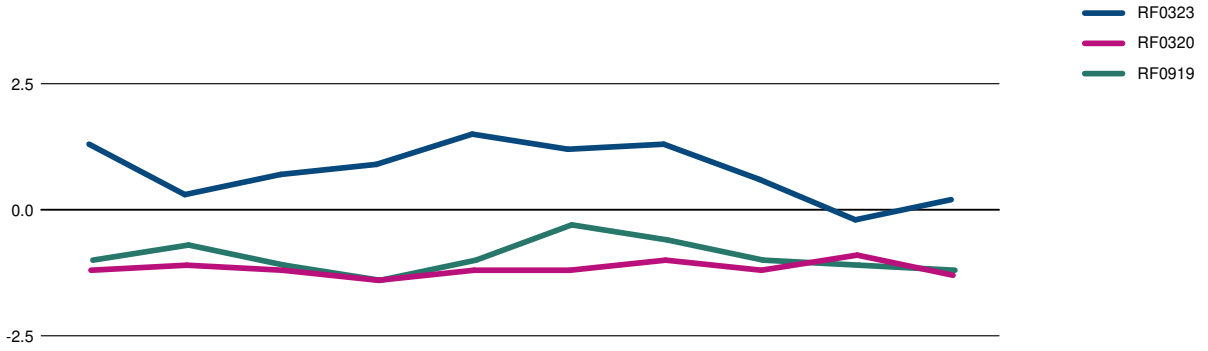
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
3	RF0323	1.3	0.3	0.7	0.9	1.5	1.2	1.3	0.6	-0.2	0.2	0%	0%	100%
8	RF0320	-1.2	-1.1	-1.2	-1.4	-1.2	-1.2	-1.0	-1.2	-0.9	-1.3	0%	0%	100%
1	RF0919	-1.0	-0.7	-1.1	-1.4	-1.0	-0.3	-0.6	-1.0	-1.1	-1.2	0%	0%	100%
3	RF0319	-1.7	-1.6	-1.5	-1.7	-1.7	-1.5	-1.7	-1.5	-1.5	-1.3	0%	0%	100%
2	RF0918	-1.5	-1.2	-0.8	-1.3	-1.1	-1.3	-1.2	-1.2	-1.3	-1.1	0%	0%	100%
2	RF0318	-1.1	-1.0	-1.0	-0.8	-0.9	-1.0	-1.0	-1.4	-1.0	-1.1	0%	0%	100%
2	RF0917	-0.9	-1.0	-0.8	-1.0	-1.0	-1.1	-1.1	-1.0	-1.3	-1.1	0%	0%	100%
2	RF0317	-1.3	-1.5	-1.3	-1.4	-1.4	-1.6	-1.4	-1.5	-1.3	-1.2	0%	0%	100%
2	RF0916	-0.6	-1.4	-1.4	-1.2	-1.5	-1.4	-1.3	-1.4	-0.7	-1.5	0%	0%	100%
3	RF0316	-1.7	-1.9	-1.6	-1.4	-1.6	-2.3	-2.2	-1.8	-1.9	-1.6	20%	0%	80%

ZSCORE-FIX - SCC
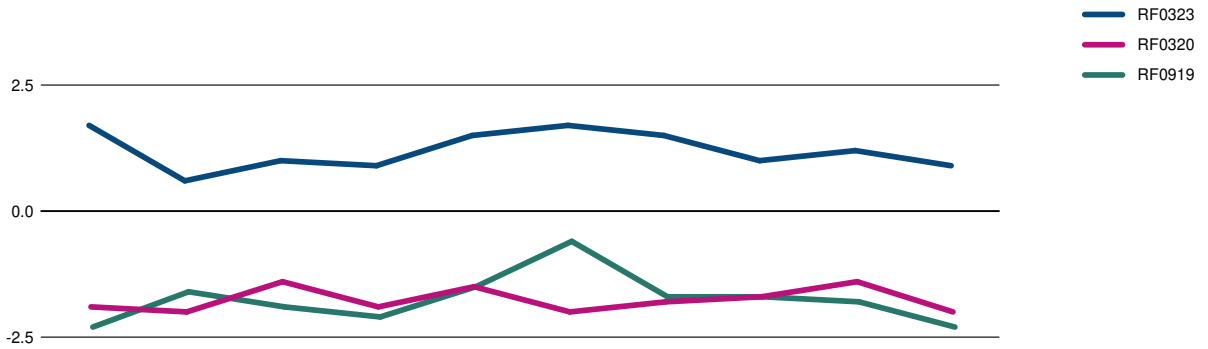
Part. code	Round	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	Yellow	Red	White
3	RF0323	1.7	0.6	1.0	0.9	1.5	1.7	1.5	1.0	1.2	0.9	0%	0%	100%
8	RF0320	-1.9	-2.0	-1.4	-1.9	-1.5	-2.0	-1.8	-1.7	-1.4	-2.0	0%	0%	100%
1	RF0919	-2.3	-1.6	-1.9	-2.1	-1.5	-0.6	-1.7	-1.7	-1.8	-2.3	30%	0%	70%
3	RF0319	-2.6	-2.5	-2.8	-2.4	-2.7	-2.7	-2.4	-3.2	-3.2	-3.0	80%	20%	0%
2	RF0918	-3.8	-2.6	-1.7	-2.5	-2.4	-2.9	-2.9	-3.1	-3.3	-2.7	60%	30%	10%
2	RF0318	-2.3	-2.4	-1.7	-2.4	-1.8	-1.7	-2.7	-2.9	-2.0	-3.1	50%	10%	40%
2	RF0917	-2.3	-3.4	-2.2	-2.6	-3.0	-3.8	-3.7	-4.0	-3.4	-3.6	40%	60%	0%
2	RF0317	-1.9	-2.0	-1.8	-3.0	-2.2	-2.5	-2.4	-1.9	-2.8	-2.7	60%	0%	40%
2	RF0916	-0.9	-2.9	-2.1	-1.8	-2.5	-2.1	-2.8	-2.6	-1.3	-3.2	60%	10%	30%
3	RF0316	-3.4	-3.3	-1.9	-1.8	-1.9	-3.9	-3.1	-2.4	-2.8	-2.4	30%	40%	30%

ZSCORE-PT - SCC - Sample A and B
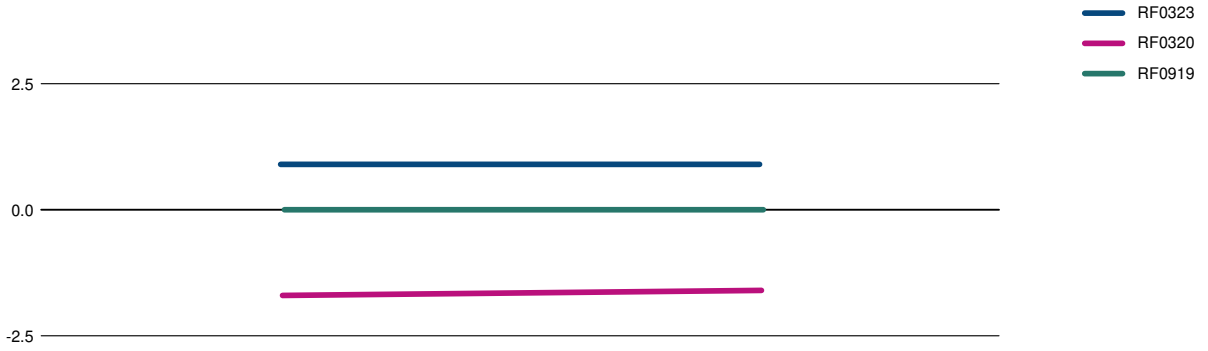
Part. code	Round	Sample A	Sample B	Yellow	Red	White
3	RF0323	0.9	0.9	0%	0%	100%
8	RF0320	-1.7	-1.6	0%	0%	100%
1	RF0919	0.0	0.0	0%	0%	100%
3	RF0319	0.0	0.0	0%	0%	100%
2	RF0918	0.0	0.0	0%	0%	100%
2	RF0318	0.0	0.0	0%	0%	100%
2	RF0917	0.0	0.0	0%	0%	100%
2	RF0317	0.0	0.0	0%	0%	100%
2	RF0916	0.0	0.0	0%	0%	100%
3	RF0316	0.0	0.0	0%	0%	100%

ZSCORE-FIX - SCC - Sample A and B
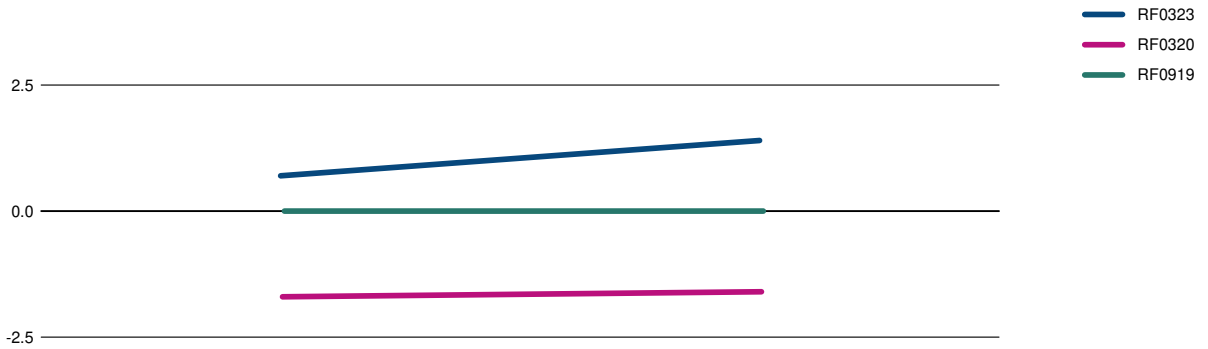
Part. code	Round	Sample A	Sample B	Yellow	Red	White
3	RF0323	0.7	1.4	0%	0%	100%
8	RF0320	-1.7	-1.6	0%	0%	100%
1	RF0919	0.0	0.0	0%	0%	100%
3	RF0319	0.0	0.0	0%	0%	100%
2	RF0918	0.0	0.0	0%	0%	100%
2	RF0318	0.0	0.0	0%	0%	100%
2	RF0917	0.0	0.0	0%	0%	100%
2	RF0317	0.0	0.0	0%	0%	100%
2	RF0916	0.0	0.0	0%	0%	100%
3	RF0316	0.0	0.0	0%	0%	100%

ICAR
PROFICIENCY TESTING SCHEME

March 2023

Raw Milk

Determination of FAT CONTENT
Röse Gottlieb method

Sending date of statistical treatment :   24th March 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)		
ICAR Staff	Silvia Orlandini	pt@icar.org	silvia@icar.org

Proficiency test accreditated ISO 17043

Table I :   **Ranking of the laboratories**   Units : g / 100 g

Nb	%	N°	d	Sd	D	Method
1	7	6	+ 0,003	0,003	0,004	A
2	14	10	- 0,004	0,004	0,006	A
3	21	5	- 0,004	0,005	0,006	A
4	29	9	- 0,006	0,005	0,008	A
5	36	8	- 0,003	0,010	0,010	B
6	43	11	- 0,001	0,012	0,012	A
7	50	2	- 0,012	0,004	0,012	C
8	57	12	- 0,005	0,012	0,013	A
9	64	7	- 0,004	0,014	0,014	A
10	71	13	+ 0,010	0,013	0,017	A
11	79	14	+ 0,014	0,010	0,017	A
12	86	3	- 0,029	0,019	0,035	A
13	93	4	+ 0,029	0,023	0,037	B
14	100	1	- 0,026	0,069	0,073	A

The table should be studied in parallel with figure 1 where the laboratories are located according to an acceptability area (or target) the limits of which are :

+/- 0,020 g / 100 g for $\bar{d}$ and 0,030 g / 100 g for Sd

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 13 laboratories using the reference method ISO 1211|IDF 1, after outliers discarding using Grubbs test at 5% risk level,

A   ISO 1211|IDF 1   Röse Gottlieb Method
B   ISO 2446 / IDF 226
C   Not specified

(NC : OUT of RANKING because of insufficient data number)

(Nb : laboratory rank;   % : relative rank)

(N° : laboratory identification number)

(d et Sd : mean and standard deviation of the differences (laboratory -reference))

(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

Note :   Limits are only indicative and so far do not constitute standard values; they indicate what is normally
        reachable by labs for their self evaluation.

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %)	Sr$_{PT}$	0,005
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR$_{PT}$	0,015

Table II :   **REPEATABILITY - Absolute difference between replicates in g / 100 g**

Sample/Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0,000	0,010	0,010	0,000	0,010	0,020	0,410 *	0,010	0,030 *	0,030	0,092	20
2	0,009	0,007	0,007	0,006	0,012	0,014	0,009	0,006	0,005	0,016	0,007	20
3	0,006	0,002	0,010	0,024 *	0,036 *	0,011	0,023 *	0,020	0,007	0,014	0,013	20
4	0,020	0,000	0,000	0,048 *	0,000	0,000	0,000	0,000	0,000	0,000	0,012	20
5	0,006	0,000	0,000	0,002	0,006	0,004	0,002	0,000	0,003	0,004	0,002	20
6	0,004	0,003	0,002	0,000	0,003	0,006	0,006	0,003	0,004	0,010	0,003	20
7	0,009	0,001	0,007	0,013	0,003	0,007	0,008	0,007	0,002	0,012	0,006	20
8	0,004	0,020 *	0,001	0,010	0,018	0,002	0,001	0,002	0,008	0,005	0,007	20
9	0,003	0,008	0,005	0,008	0,000	0,006	0,002	0,002	0,003	0,006	0,004	20
10	0,006	0,000	0,014	0,001	0,015	0,008	0,001	0,014	0,005	0,007	0,006	20
11	0,002	0,003	0,002	0,006	0,007	0,002	0,009	0,007	0,000	0,003	0,004	20
12	0,009	0,001	0,001	0,003	0,002	0,006	0,000	**	0,011	0,016	0,005	18
13	0,001	0,000	0,002	0,000	0,002	0,001	0,006	0,003	0,004	0,000	0,002	20
14	0,007	0,002	0,003	0,000	0,003	0,004	0,002	0,005	0,003	0,002	0,003	20
Sr	0,005	0,005	0,004	0,011	0,009	0,006	0,078	0,006	0,007	0,008		278
NE	28	28	28	28	28	28	28	26	28	28		
L	0,020	0,011	0,016	0,015	0,022	0,022	0,013	0,021	0,013	0,031		

Sr : repeatability standard deviation of each laboratory limit 0,016 g/100g

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.
SE : repeatability standard deviation per sample

NE : number of measurements per sample
*: discarded data using the test of Cochran at 5 %
** : missing data
r : limit of repeatability, absolute difference betwen two replicates=0,043 according ISO 1211 IDF 1D 2010

Table III :   **Means of the replicates in g / 100 g**

Sample\Lab code	1	2	3	4	5	6	7	8	9	10
1	4,630	2,145	3,455	2,810	4,125	2,430	3,585 *	3,085	1,495	4,485
2	4,655	2,121	3,459	2,793	4,130	2,414	3,787	3,071	1,465	4,492
3	4,642	2,123	3,466	2,778	4,111	2,377 *	3,765	3,040 *	1,415 *	4,494
4	4,708	2,140	3,502	2,845 *	4,182	2,432	3,842	3,113 *	1,459	4,572
5	4,649	2,131	3,466	2,794	4,138	2,412	3,796	3,083	1,481	4,512
6	4,666	2,134	3,475	2,806	4,151	2,423	3,804	3,086	1,475	4,514
7	4,653	2,132	3,469	2,798	4,165	2,420	3,767	3,084	1,483	4,494
8	4,649	2,126	3,462	2,812	4,120	2,426	3,799	3,089	1,477	4,512
9	4,650	2,130	3,467	2,797	4,126	2,415	3,793	3,079	1,473	4,511
10	4,655	2,121	3,464	2,803	4,135	2,417	3,797	3,081	1,477	4,515
11	4,652	2,131	3,475	2,790	4,160	2,426	3,806	3,093	1,473	4,483
12	4,664	2,132	3,464	2,802	4,139	2,424	3,805		1,444	4,501
13	4,679	2,125	3,483	2,808	4,164	2,415	3,816	3,092	1,474	4,547
14	4,689	2,129	3,490	2,813	4,168	2,420	3,816	3,094	1,491	4,529
M	4,660	2,130	3,471	2,800	4,144	2,421	3,799	3,085	1,474	4,511
REF.	4,659	2,130	3,471	2,802	4,145	2,422	3,800	3,086	1,476	4,511
SD	0,020	0,007	0,013	0,010	0,021	0,006	0,020	0,007	0,013	0,025

M = mean per sample   REF. = reference values

SD = standard deviation per sample   *: discarded data using the test of Grubbs at 5 %

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528,
of 13 laboratories using the reference method ISO 1211│IDF 1, after outliers discarding using Grubbs test at 5 %
risk level.

Table IV :   Outlier identification

Sample	1	2	3	4	5	6	7	8	9	10
Outliers Cochran		8		3; 4	3		1; 3		1	
Outlier Grubbs				4		3	1	3; 4	3	
sr	0,005	0,003	0,004	0,004	0,006	0,006	0,004	0,005	0,004	0,008
SR	0,020	0,007	0,013	0,008	0,020	0,008	0,018	0,007	0,012	0,025

Table V :   **ACCURACY - differences (laboratory - reference) in g / 100 g**

Sample\Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd$_{lab}$	t
1	- 0,029	+ 0,015	- 0,016	+ 0,008	- 0,020	+ 0,008	- 0,215	- 0,001	+ 0,019	- 0,026	- 0,026	0,069	1,18
2	- 0,004	- 0,010	- 0,012	- 0,009	- 0,015	- 0,008	- 0,014	- 0,015	- 0,012	- 0,019	- 0,012	0,004	8,71
3	- 0,017	- 0,007	- 0,005	- 0,024	- 0,034	- 0,045	- 0,036	- 0,046	- 0,062	- 0,017	- 0,029	0,019	4,98
4	+ 0,049	+ 0,010	+ 0,031	+ 0,043	+ 0,037	+ 0,010	+ 0,042	+ 0,027	- 0,017	+ 0,061	+ 0,029	0,023	4,05
5	- 0,010	+ 0,001	- 0,005	- 0,008	- 0,007	- 0,010	- 0,004	- 0,003	+ 0,004	+ 0,001	- 0,004	0,005	2,58
6	+ 0,007	+ 0,003	+ 0,004	+ 0,004	+ 0,006	+ 0,001	+ 0,004	- 0,001	- 0,001	+ 0,003	+ 0,003	0,003	3,75
7	- 0,006	+ 0,001	- 0,002	- 0,004	+ 0,020	- 0,002	- 0,033	- 0,003	+ 0,007	- 0,017	- 0,004	0,014	0,89
8	- 0,010	- 0,004	- 0,009	+ 0,010	- 0,025	+ 0,004	- 0,002	+ 0,003	+ 0,001	+ 0,001	- 0,003	0,010	0,99
9	- 0,009	- 0,000	- 0,004	- 0,005	- 0,019	- 0,007	- 0,007	- 0,007	- 0,004	+ 0,000	- 0,006	0,005	3,60
10	- 0,004	- 0,009	- 0,007	+ 0,001	- 0,010	- 0,005	- 0,004	- 0,005	+ 0,000	+ 0,004	- 0,004	0,004	2,71
11	- 0,007	+ 0,000	+ 0,004	- 0,012	+ 0,015	+ 0,004	+ 0,005	+ 0,006	- 0,003	- 0,028	- 0,001	0,012	0,38
12	+ 0,005	+ 0,001	- 0,007	- 0,000	- 0,006	+ 0,002	+ 0,005		- 0,033	- 0,010	- 0,005	0,012	1,20
13	+ 0,020	- 0,005	+ 0,012	+ 0,006	+ 0,019	- 0,007	+ 0,016	+ 0,005	- 0,002	+ 0,036	+ 0,010	0,013	2,37
14	+ 0,030	- 0,001	+ 0,019	+ 0,011	+ 0,023	- 0,002	+ 0,016	+ 0,007	+ 0,014	+ 0,018	+ 0,014	0,010	4,31
d	+ 0,001	- 0,000	+ 0,000	- 0,001	- 0,001	- 0,001	- 0,001	- 0,001	- 0,002	+ 0,001	- 0,003	0,025	
Sd	0,020	0,007	0,013	0,010	0,021	0,006	0,020	0,007	0,013	0,025	0,016		

d = mean of differences   Sd = standard deviation of differences   t = Student test - comparison to 0

Upper limits :   d = +/- 0,02 g / 100 g   Sd = 0,03 g / 100g

ISO 1211|IDF 1 : Precision of the method :   Sr = 0.016 g / 100 g
                                                                     SR = 0.020 g / 100 g

Table VI :   **Zscore of the different laboratories for each sample.**
                     ZS calculated on the PT standard deviation

Sample \ Lab code	1	2	3	4	5	6	7	8	9	10
1	-1,43	+2,19	-1,23	+0,85	-0,93	+1,31	-10,60	-0,20	+1,43	-1,04
2	-0,21	-1,40	-0,96	-0,85	-0,69	-1,18	-0,68	-2,31	-0,88	-0,75
3	-0,83	-1,04	-0,38	-2,35	-1,59	-7,04	-1,77	-6,98	-4,66	-0,67
4	+2,45	+1,45	+2,41	+4,34	+1,77	+1,63	+2,05	+4,01	-1,29	+2,49
5	-0,49	+0,13	-0,38	-0,75	-0,32	-1,50	-0,22	-0,50	+0,33	+0,06
6	+0,36	+0,50	+0,32	+0,45	+0,28	+0,22	+0,18	-0,13	-0,08	+0,14
7	-0,31	+0,21	-0,19	-0,40	+0,94	-0,33	-1,64	-0,43	+0,52	-0,67
8	-0,49	-0,60	-0,73	+1,04	-1,17	+0,69	-0,09	+0,40	+0,07	+0,04
9	-0,46	-0,01	-0,34	-0,45	-0,88	-1,03	-0,36	-1,11	-0,27	+0,02
10	-0,19	-1,33	-0,53	+0,10	-0,48	-0,72	-0,19	-0,81	+0,03	+0,16
11	-0,34	+0,06	+0,32	-1,15	+0,70	+0,69	+0,25	+0,93	-0,23	-1,14
12	+0,23	+0,21	-0,57	-0,00	-0,27	+0,4	+0,2		-2,5	-0,39
13	+0,98	-0,75	+0,94	+0,65	+0,92	-1,1	+0,8	+0,78	-0,2	+1,48
14	+1,48	-0,16	+1,44	+1,14	+1,08	-0,2	+0,8	+1,08	+1,1	+0,75

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 2 :
Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation
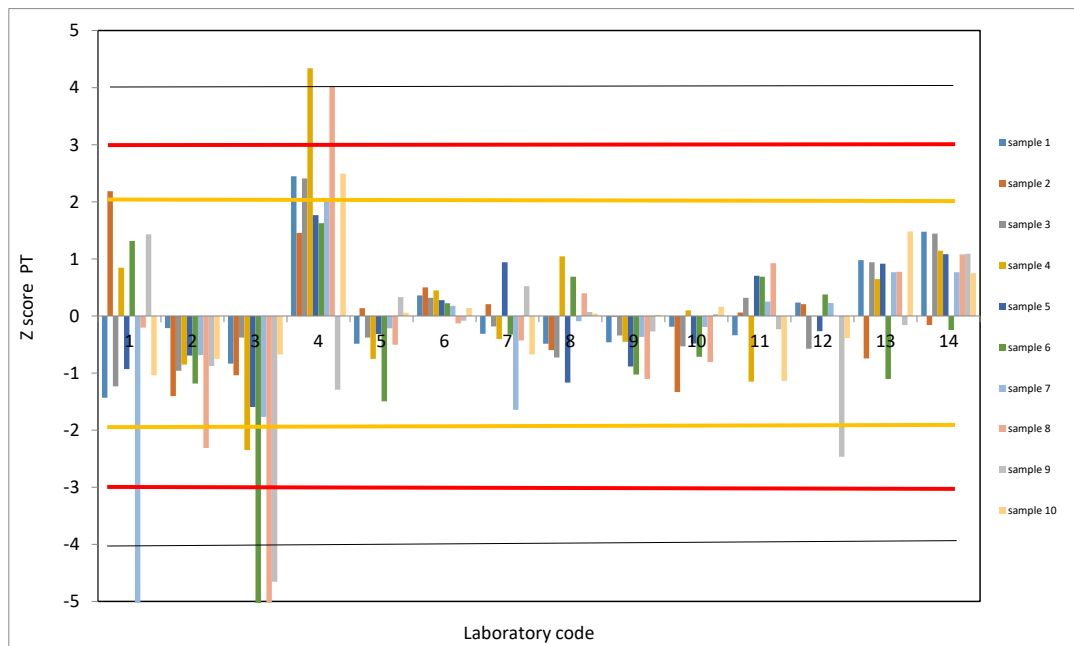
Table VII : Zscore of the different laboratories for each sample.
ZS calculated on the standard deviation of reproducibility of the method

Sample\Lab Code	1	2	3	4	5	6	7	8	9	10
1	-1,44	+0,75	-0,79	+0,42	-0,98	+0,42	-10,77	-0,07	+0,94	-1,28
2	-0,21	-0,48	-0,62	-0,43	-0,73	-0,38	-0,70	-0,77	-0,58	-0,93
3	-0,84	-0,35	-0,24	-1,18	-1,68	-2,25	-1,80	-2,32	-3,08	-0,83
4	+2,46	+0,50	+1,56	+2,17	+1,87	+0,52	+2,08	+1,33	-0,86	+3,07
5	-0,49	+0,05	-0,24	-0,38	-0,33	-0,48	-0,22	-0,17	+0,22	+0,07
6	+0,36	+0,17	+0,21	+0,22	+0,29	+0,07	+0,18	-0,04	-0,06	+0,17
7	-0,31	+0,07	-0,12	-0,20	+0,99	-0,10	-1,67	-0,14	+0,34	-0,83
8	-0,49	-0,20	-0,47	+0,52	-1,23	+0,22	-0,10	+0,13	+0,04	+0,05
9	-0,46	-0,00	-0,22	-0,23	-0,93	-0,33	-0,37	-0,37	-0,18	+0,02
10	-0,19	-0,45	-0,34	+0,05	-0,51	-0,23	-0,20	-0,27	+0,02	+0,20
11	-0,34	+0,02	+0,21	-0,58	+0,74	+0,22	+0,25	+0,31	-0,16	-1,40
12	+0,24	+0,07	-0,37	-0,00	-0,28	+0,12	+0,2		-1,63	-0,48
13	+0,99	-0,25	+0,61	+0,32	+0,97	-0,35	+0,8	+0,26	-0,11	+1,82
14	+1,49	-0,05	+0,93	+0,57	+1,14	-0,08	+0,8	+0,36	+0,72	+0,92

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation
has always the value of SR of the method SR=0,02

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 3 :
Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method
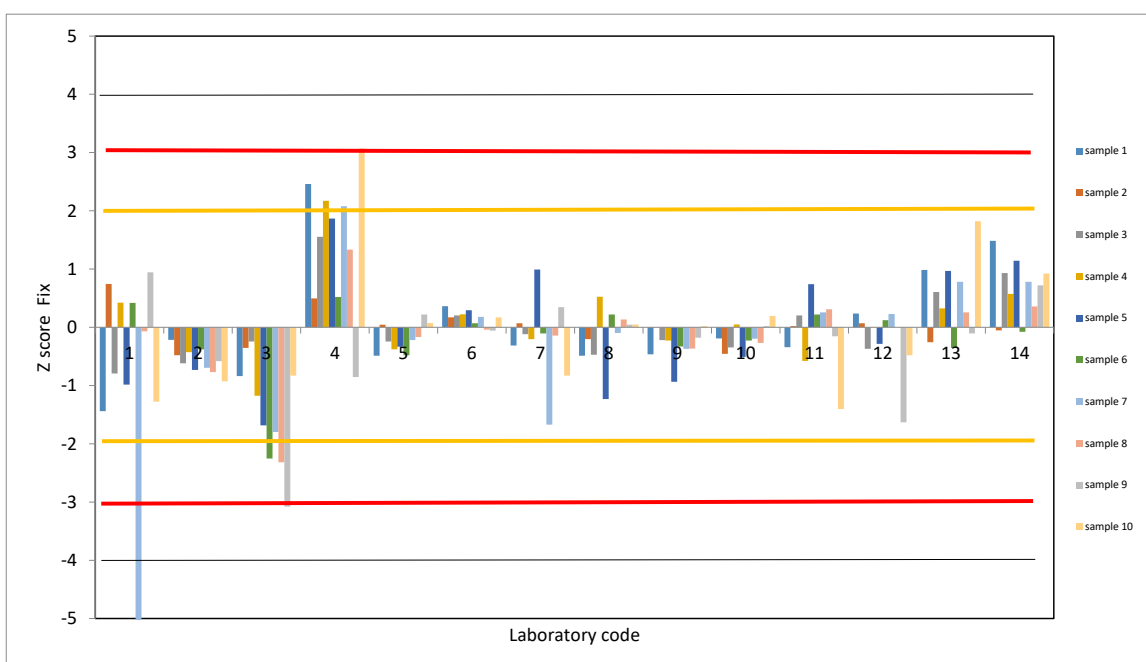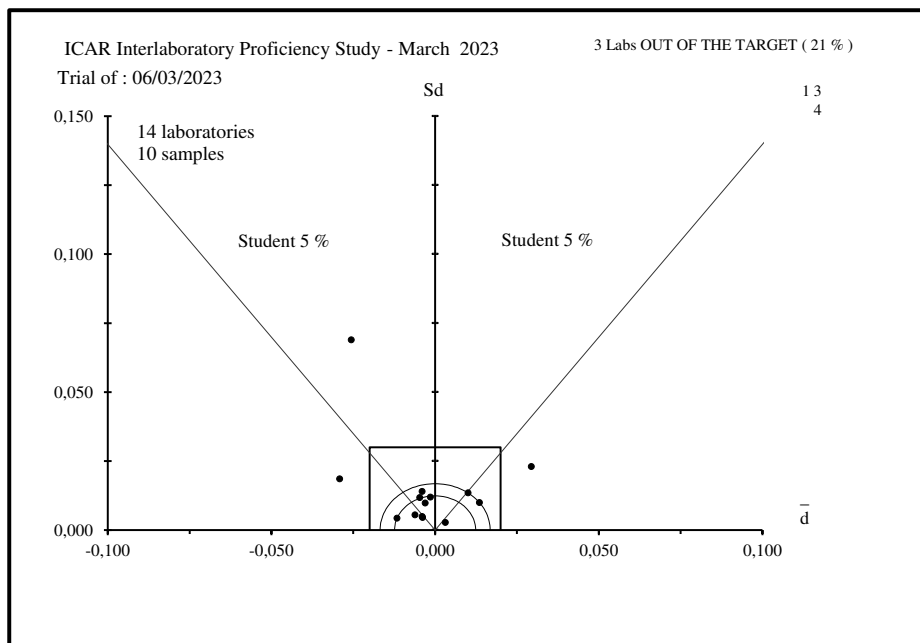
Figure 1 :   **ACCURACY - Evaluation of the individual performances (to see table I).**

ICAR
PROFICIENCY TESTING SCHEME

March 2023

Raw Milk

Determination of CRUDE PROTEIN CONTENT
KJELDAHL Method

Sending date of statistical treatment :   24th March 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)
ICAR Staff	Silvia Orlandini pt@icar.org silvia@icar.org

Proficiency test accreditated ISO 17043

Table I :   **Ranking of the laboratories**   <u>Units : g / 100 g</u>

Nb	%	N°	d	Sd	D
1	8	5	- 0,003	0,006	0,007
2	15	8	- 0,002	0,007	0,008
3	23	11	- 0,000	0,008	0,008
4	31	9	+ 0,001	0,008	0,008
5	38	7	- 0,008	0,006	0,010
6	46	12	- 0,007	0,009	0,012
7	54	4	+ 0,014	0,009	0,017
8	62	6	- 0,017	0,011	0,021
9	69	3	- 0,021	0,014	0,025
10	77	13	+ 0,022	0,017	0,028
11	85	10	+ 0,036	0,006	0,036
12	92	1	- 0,026	0,030	0,039
13	100	2	+ 0,008	0,536	0,537

The table should be studied in parallel with figure 1 where the laboratories are located according to an acceptability area (or target) the limits of which are :

$$+/- \; 0{,}025 \; g \; / \; 100 \; g \; \text{for} \; \bar{d} \; \text{and} \; 0{,}020 \; g \; / \; 100 \; g \; \text{for} \; Sd$$

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 13 laboratories using the reference method (ISO 8968-1│IDF 20-1 and ISO 8968-3│IDF 20-3), after outlier discarding using Grubbs test at 5% risk level

<u>N.B.</u> : N° 7 and N° 9 : ISO 8968-3│IDF 20-3

(NC : OUT of RANKING because of insufficient data number)

(Nb : laboratory rank; % : relative rank)
(N° : laboratory identification number)
(d et Sd : mean and standard deviation of the differences (laboratory -reference))

(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

<u>Note</u> :   Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation.

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %)	Sr_{PT}	0,006
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,020

Table II :   **REPEATABILITY - Absolute difference between replicates in g / 100 g**

Sample\Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	20
2	0,001	0,000	0,003	0,002	0,002	0,001	0,003	0,000	**	0,005	0,002	18
3	0,013	**	0,012	0,020	0,025	0,008	0,022	0,014	0,001	0,026	0,012	18
4	0,022	0,003	0,004	0,004	0,003	0,019	0,002	0,026 *	0,005	0,015	0,010	20
5	0,001	0,003	0,006	0,003	0,000	0,003	0,003	0,001	0,002	0,002	0,002	20
6	0,001	0,001	0,009	0,013	0,001	0,003	0,000	0,001	0,004	0,001	0,004	20
7	0,000	0,006	0,010	0,004	0,002	0,005	0,004	0,001	0,006	0,001	0,003	20
8	0,013	0,006	0,010	0,002	0,022	0,004	0,011	0,003	0,003	0,033	0,010	20
9	0,000	0,000	0,000	0,013	0,006	0,006	0,013	0,013	0,006	0,006	0,006	20
10	0,001	0,003	0,011	0,000	0,009	0,006	0,004	0,007	0,010	0,006	0,005	20
11	0,011	0,001	0,003	0,006	0,036	0,000	0,013	0,011	0,001	0,011	0,010	20
12	0,002	0,013 *	0,006	0,003	0,016	0,012	0,011	0,003	0,009	0,006	0,007	20
13	0,007	0,004	0,007	0,002	0,004	0,006	0,006	0,003	0,004	0,003	0,003	20
Sr	0,006	0,003	0,005	0,006	0,010	0,005	0,007	0,007	0,004	0,009		256
NE	26	24	26	26	26	26	26	26	24	26		
L	0,023	0,008	0,019	0,021	0,038	0,020	0,024	0,017	0,013	0,034		

Sr : repeatability standard deviation of each laboratory limit 0,014 g /100g

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.

SE : repeatability standard deviation per sample

NE : number of measurements per sample

*: discarded data using the test of Cochran at 5 %

** : missing data

r : limit of repeatability, absolute difference betwen two replicates=0,040 accordingISO 8968-1 │IDF 20-1

Table III :   **Means of the replicates in g / 100 g**

Sample\Lab code	1	2	3	4	5	6	7	8	9	10
1	3,714 *	2,701	3,253	2,934	3,575	2,831	3,441	3,066	3,278	3,685
2	2,725 *	3,799 *	3,315	2,924	3,607	2,822	3,507	3,106		3,698
3	3,772		3,300	2,890	3,558	2,820	3,469	3,098	3,278	3,645
4	3,799	2,731	3,322	2,936	3,616	2,825	3,513	3,138	3,306	3,688
5	3,787	2,712	3,296	2,909	3,593	2,811	3,496	3,102	3,304	3,698
6	3,774	2,700	3,272	2,911	3,557	2,805	3,498	3,099	3,279	3,665
7	3,778	2,710	3,300	2,919	3,580	2,811	3,490	3,093	3,303	3,668
8	3,780	2,717	3,306	2,921	3,589	2,823	3,492	3,110	3,306	3,667
9	3,783	2,718	3,305	2,916	3,589	2,810	3,490	3,113	3,321	3,697
10	3,824	2,751	3,343	2,945	3,637	2,851 *	3,534	3,141	3,343	3,727
11	3,794	2,726	3,312	2,926	3,581	2,825	3,493	3,095	3,298	3,684
12	3,766	2,715	3,296	2,904	3,584	2,823	3,488	3,095	3,314	3,681
13	3,819	2,720	3,324	2,920	3,630	2,822	3,531	3,127	3,326	3,741
M	3,789	2,718	3,304	2,920	3,592	2,819	3,496	3,106	3,305	3,688
REF.	3,788	2,717	3,305	2,920	3,592	2,819	3,497	3,107	3,304	3,687
SD	0,019	0,014	0,023	0,014	0,025	0,008	0,024	0,020	0,020	0,026

M = mean per sample   REF. = reference values
SD = standard deviation per sample   *: discarded data using the test of Grubbs 5 %

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 13 laboratories using the reference method ISO 8968-1│IDF 20-1 and ISO 8968-3│IDF 20-3, after outliers discarging using Grubbs test at 5 % risk level.

Table IV :   Outlier identification

Sample	1	2	3	4	5	6	7	8	9	10	
Outliers Cochran		12						4			
Outlier Grubbs	2	2				10					
sr	0,007	0,002	0,005	0,006	0,010	0,006	0,007	0,005	0,004	0,009	
SR	0,020	0,015	0,023	0,015	0,026	0,009	0,025	0,019	0,020	0,026	

Table V :   **ACCURACY - differences (laboratory - reference) in g / 100 g**

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd$_{lab}$	t
1	- 0,074	- 0,016	- 0,052	+ 0,014	- 0,017	+ 0,012	- 0,056	- 0,041	- 0,026	- 0,002	- 0,026	0,030	2,75
2	- 1,063	+ 1,082	+ 0,011	+ 0,004	+ 0,015	+ 0,002	+ 0,011	- 0,001		+ 0,012	+ 0,008	0,536	0,05
3	- 0,016		- 0,005	- 0,030	- 0,034	+ 0,001	- 0,028	- 0,009	- 0,026	- 0,042	- 0,021	0,014	4,32
4	+ 0,011	+ 0,014	+ 0,018	+ 0,016	+ 0,024	+ 0,006	+ 0,016	+ 0,031	+ 0,002	+ 0,001	+ 0,014	0,009	4,69
5	- 0,001	- 0,005	- 0,009	- 0,011	+ 0,002	- 0,008	- 0,001	- 0,005	- 0,000	+ 0,011	- 0,003	0,006	1,39
6	- 0,014	- 0,017	- 0,032	- 0,009	- 0,034	- 0,014	+ 0,001	- 0,008	- 0,025	- 0,022	- 0,017	0,011	4,97
7	- 0,010	- 0,007	- 0,005	- 0,001	- 0,012	- 0,008	- 0,007	- 0,013	- 0,001	- 0,019	- 0,008	0,006	4,69
8	- 0,008	+ 0,000	+ 0,002	+ 0,001	- 0,003	+ 0,004	- 0,005	+ 0,003	+ 0,002	- 0,020	- 0,002	0,007	1,08
9	- 0,005	+ 0,001	+ 0,000	- 0,004	- 0,003	- 0,009	- 0,007	+ 0,007	+ 0,017	+ 0,010	+ 0,001	0,008	0,28
10	+ 0,037	+ 0,034	+ 0,038	+ 0,025	+ 0,046	+ 0,031	+ 0,037	+ 0,034	+ 0,039	+ 0,040	+ 0,036	0,006	20,69
11	+ 0,006	+ 0,009	+ 0,008	+ 0,006	- 0,010	+ 0,006	- 0,004	- 0,012	- 0,007	- 0,002	- 0,000	0,008	0,02
12	- 0,022	- 0,002	- 0,009	- 0,016	- 0,008	+ 0,004	- 0,009	- 0,012	+ 0,010	- 0,006	- 0,007	0,009	2,35
13	+ 0,031	+ 0,003	+ 0,019	- 0,000	+ 0,039	+ 0,003	+ 0,034	+ 0,021	+ 0,022	+ 0,054	+ 0,022	0,017	4,06
d	+ 0,001	+ 0,001	- 0,001	- 0,000	+ 0,000	- 0,000	- 0,001	- 0,000	+ 0,001	+ 0,001	+ 0,001	0,136	
Sd	0,019	0,014	0,023	0,014	0,025	0,008	0,024	0,020	0,020	0,026	0,020		

d = mean of differences   Sd = standard deviation of differences   t = Student test - comparison to 0

Upper limits : $\overline{d}$ = +/- 0,025 g / 100 g   Sd = 0,020 g / 100 g

ISO 8968-1|IDF 20-1 : Precision of the method : Sr = 0.014 g / 100 g
SR = 0.018 g / 100 g

Table VI :   **Zscore of the different laboratories for each sample.**
              ZS calculated on the PT standard deviation

Sample\Lab code	1	2	3	4	5	6	7	8	9	10
1	-3,91	-1,11	-2,27	+0,97	-0,68	+1,53	-2,32	-2,03	-1,30	-0,07
2	-56,20	+75,75	+0,47	+0,30	+0,62	+0,31	+0,44	-0,05		+0,45
3	-0,85		-0,21	-2,08	-1,38	+0,15	-1,15	-0,43	-1,31	-1,63
4	+0,58	+1,01	+0,77	+1,09	+0,98	+0,76	+0,67	+1,53	+0,11	+0,04
5	-0,04	-0,33	-0,37	-0,79	+0,06	-1,00	-0,05	-0,26	-0,01	+0,42
6	-0,75	-1,20	-1,42	-0,61	-1,39	-1,86	+0,05	-0,40	-1,26	-0,85
7	-0,54	-0,49	-0,22	-0,04	-0,47	-1,04	-0,28	-0,67	-0,05	-0,73
8	-0,43	+0,01	+0,07	+0,07	-0,11	+0,47	-0,20	+0,14	+0,09	-0,78
9	-0,24	+0,07	+0,00	-0,30	-0,12	-1,12	-0,29	+0,33	+0,84	+0,40
10	+1,93	+2,37	+1,68	+1,74	+1,85	+4,04	+1,52	+1,68	+1,93	+1,57
11	+0,31	+0,61	+0,34	+0,41	-0,42	+0,76	-0,16	-0,57	-0,32	-0,10
12	-1,17	-0,13	-0,39	-1,08	-0,31	+0,47	-0,38	-0,61	+0,52	-0,23
13	+1,63	+0,21	+0,83	-0,02	+1,56	+0,35	+1,42	+1,03	+1,09	+2,10

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 2 :
Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation
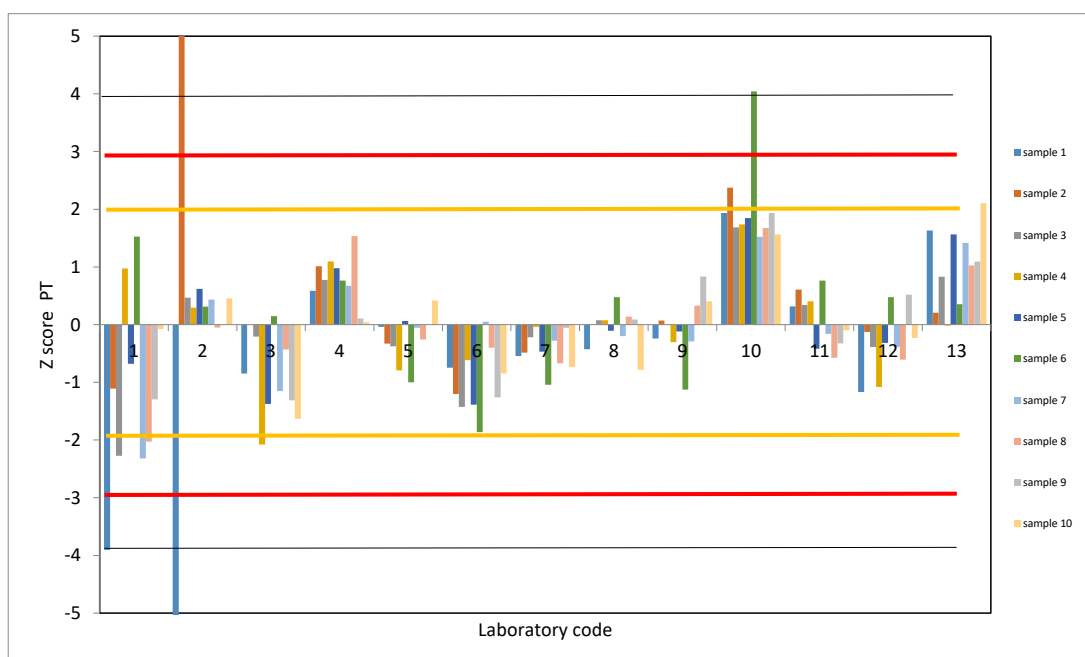
Table VII :   **Zscore of the different laboratories for each sample.**
                         ZS calculated on the standard deviation of reproducibility of the method

Sample\Lab code	1	2	3	4	5	6	7	8	9	10
1	-4,11	-0,88	-2,87	+0,78	-0,93	+0,66	-3,11	-2,27	-1,44	-0,11
2	-59,07	+60,14	+0,59	+0,24	+0,85	+0,13	+0,58	-0,06		+0,64
3	-0,89		-0,26	-1,66	-1,88	+0,06	-1,54	-0,48	-1,46	-2,32
4	+0,61	+0,80	+0,98	+0,87	+1,34	+0,33	+0,90	+1,71	+0,12	+0,06
5	-0,04	-0,26	-0,47	-0,63	+0,08	-0,43	-0,07	-0,29	-0,01	+0,59
6	-0,79	-0,95	-1,80	-0,49	-1,90	-0,80	+0,07	-0,45	-1,41	-1,20
7	-0,57	-0,39	-0,28	-0,03	-0,64	-0,45	-0,37	-0,75	-0,06	-1,04
8	-0,45	+0,00	+0,09	+0,06	-0,15	+0,21	-0,27	+0,15	+0,10	-1,11
9	-0,25	+0,06	+0,01	-0,24	-0,16	-0,49	-0,39	+0,37	+0,93	+0,57
10	+2,03	+1,88	+2,13	+1,39	+2,53	+1,75	+2,04	+1,87	+2,16	+2,22
11	+0,33	+0,48	+0,43	+0,32	-0,57	+0,33	-0,21	-0,64	-0,36	-0,14
12	-1,23	-0,10	-0,49	-0,86	-0,43	+0,21	-0,51	-0,68	+0,58	-0,33
13	+1,71	+0,16	+1,05	-0,01	+2,14	+0,15	+1,90	+1,15	+1,22	+2,98

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation has always the value of SR of the method SR=0,018

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 3 :
Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method

ICAR Interlaboratory Proficiency Study - March 2023

Trial of : 06/03/2023

3 Labs OUT OF THE TARGET (23 %)

13 laboratories
10 samples

Target limits : $\bar{d}$ = +/- 0.025 g / 100 g of milk
Sd =   0.020 g / 100 g of milk
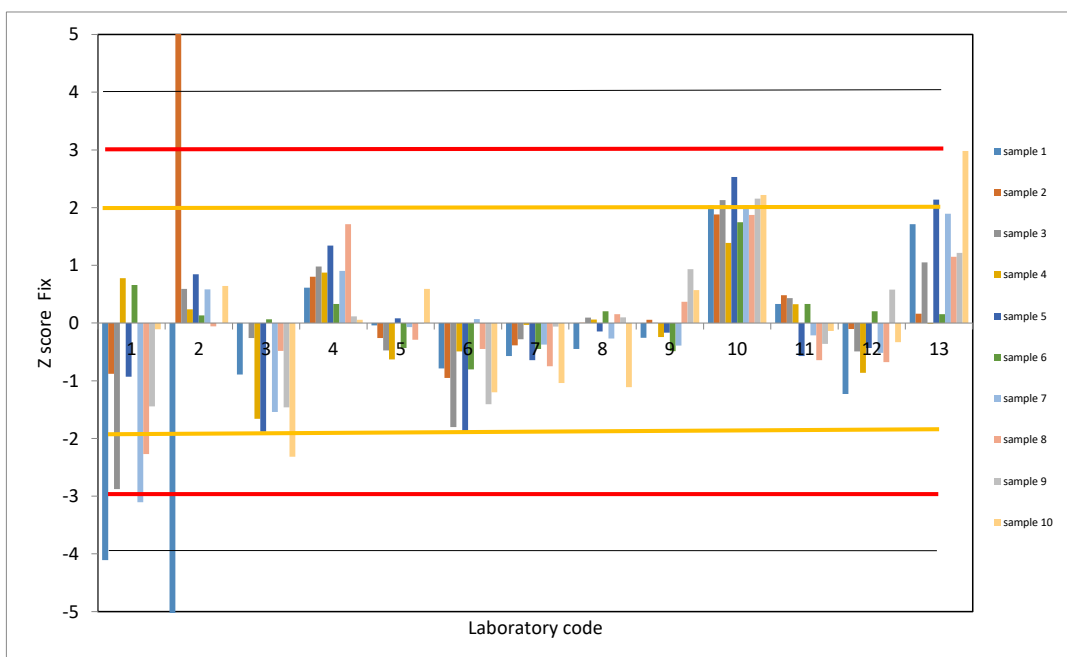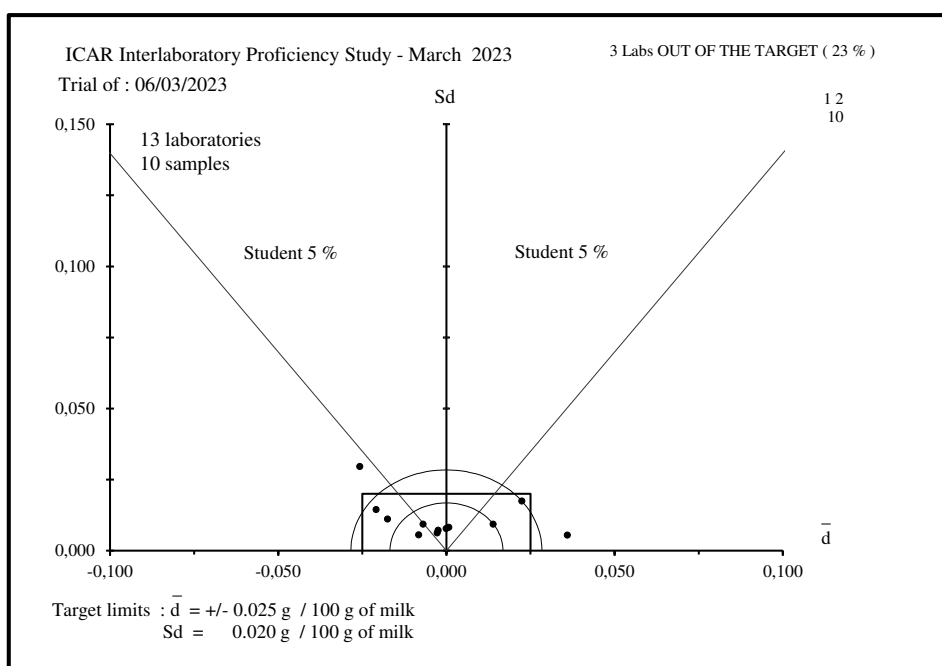
Figure 1 :   **ACCURACY - Evaluation of the individual performances (to see table I).**

Table VIII : Relative recovery of nitrogen on pure solutions

N°	TRYP	GLY	SO4
1	90,1	98,9	94,4
2	99,7	100,2	100,3
3	95,1	99,5	99,7
4	99,7	99,5	100,3
5	95,6	98,5	100,4
6	100,4	100,3	100,7
7	99,5	100,2	100,2
8	97,2	99,7	100,2
9	99,6	100,2	100,2
10	100,5	100,5	100,7
11	99,8	99,8	100,1
12			
13	98,3	112,2	99,5

TRY = Tryptophan solution to 5,60 g N/l

GLY = Glycine solution to 5.60 g N/l

SO4 = Ammonium sulfate solution to 5.60 g N/l

 TRYP : recovery 97 à 101 %

 GLY : recovery 99 à 101 %

 SO4 : recovery 99 à 101 %

ICAR

PROFICIENCY TESTING SCHEME

March 2023

Raw Milk

Determination of LACTOSE CONTENT

Sending date of statistical treatment :   24th March 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)		
ICAR Staff	Silvia Orlandini	pt@icar.org	silvia@icar.org

Table I :   **Ranking of the laboratories**   Units : g / 100 g

Nb	%	N°	d	Sd	D	Method
1	10	2	- 0,017	0,010	0,019	ISO 22662 / IDF 198
2	20	6	+ 0,021	0,011	0,024	ISO 22662 / IDF 198
3	30	7	+ 0,024	0,018	0,030	enzymatic method in house
4	40	3	+ 0,005	0,031	0,031	Gravimetric
5	50	5	+ 0,031	0,029	0,042	Lane-Eynon method
6	60	4	- 0,044	0,031	0,054	ISO 26462 / IDF 214
7	70	10	+ 0,068	0,026	0,073	liquid chromatography pulse amperometric detector
8	80	8	- 0,085	0,029	0,090	ISO 26462 / IDF 214
9	90	9	+ 0,006	0,110	0,110	enzymatic
10	100	1	+ 0,029	0,184	0,186	Own method

(NC : OUT of RANKING because of insufficient data number)

(Nb : laboratory rank;   % : relative rank)

(N° : laboratory identification number)

(d et Sd : mean and standard deviation of the differences (laboratory -reference))

(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

The table should be studied in parallel with figure 1 where the

laboratories are located according to an acceptability area (or target)

the limits of which are :

$$\overline{}$$

+/- 0.100 g / 100 g for d and 0.100 g / 100g for Sd

REF : Assigned values are robust average values per sample according to
algorithm A of standard ISO 13528, of 10 laboratories , after outliers discarding
 using Grubbs test at 5 % risk level.

Note :   Limits are only indicative and so far do not constitute standard values; they indicate what is normally
        reachable by labs for their self evaluation.

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %)	Sr_{PT}	0,012
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,056

Table II :   **REPEATABILITY - Absolute difference between replicates in g / 100 g**

Sample/Lab code	11	12	13	14	15	16	17	18	19	20	Sr	NL
1	0,001	0,007	0,000	0,007	0,002	0,011	0,000	0,020	0,006	0,004	0,006	20
2	0,001	0,002	0,024	0,010	0,006	0,003	0,000	0,007	0,004	0,003	0,006	20
3	0,047	0,016	0,002	0,034	0,020	0,016	0,021	0,019	0,009	0,024	0,017	20
4	0,020	0,024	0,019	0,018	0,002	0,013	0,031	0,031	0,026	0,013	0,015	20
5	0,006	0,002	0,009	0,005	0,007	0,003	0,003	0,007	0,004	0,001	0,004	20
6	0,007	0,006	0,004	0,000	0,004	0,005	0,005	0,005	0,008	0,001	0,004	20
7	0,006	0,030	0,013	0,003	0,015	0,003	0,030	0,023	0,040	0,044	0,018	20
8	0,023	0,003	0,014	0,048	0,004	0,015	0,023	0,024	0,020	0,010	0,016	20
9	0,008	0,004	0,005	0,005	0,013	0,015	0,002	0,015	0,007	0,006	0,006	20
10	0,029	0,027	0,012	0,013	0,040 *	0,016	0,004	0,038	0,003	0,034	0,018	20
Sr	0,014	0,011	0,009	0,014	0,011	0,008	0,012	0,015	0,012	0,014		200
NE	20	20	20	20	20	20	20	20	20	20		
L	0,050	0,039	0,031	0,050	0,024	0,028	0,042	0,053	0,042	0,049		

Sr : repeatability standard deviation of each laboratory limit 0,022 g/100g

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.

SE : repeatability standard deviation per sample

NE : number of measurements per sample

*: discarded data using the test of Cochran at 5 %

** : missing data

r : limit of repeatability, absolute difference betwen two replicates=0,061 according ISO 22662 / IDF 198

Table III :   **Means of the replicates in g / 100 g**

Sample/Lab code	11	12	13	14	15	16	17	18	19	20	LACT
1	5,023	5,175	5,078	5,252	4,638 *	4,441	4,658	5,231 *	4,571	4,798	4,903
2	4,994	5,149	5,078	5,224	4,864	4,404	4,639	4,710	4,550	4,794	4,917
3	5,029	5,212	5,106	5,261	4,915	4,409	4,626	4,731	4,545	4,791	4,934
4	4,920	5,077	4,999	5,206	4,860	4,435	4,643	4,699	4,548	4,746	4,863
5	5,081	5,221	5,132	5,282	4,914	4,462	4,640	4,724	4,597	4,827	4,915
6	5,012	5,184	5,089	5,254	4,899	4,450	4,677	4,752	4,623	4,844	4,945
7	5,059	5,177	5,111	5,276	4,896	4,458	4,659	4,746	4,585	4,850	4,874
8	4,937	5,109	5,048	5,136	4,781	4,365	4,558	4,638	4,461	4,685	4,819
9	4,915	5,063	4,992	5,132	4,839	4,638 *	4,751	4,777	4,721	4,806	
10	5,066	5,246	5,200	5,319	4,971	4,500	4,697	4,760	4,636	4,853	4,966
M	5,003	5,161	5,083	5,234	4,882	4,436	4,655	4,726	4,584	4,799	
REF.	5,003	5,161	5,081	5,234	4,884	4,437	4,655	4,730	4,582	4,804	**4,912**
SD	0,061	0,061	0,062	0,061	0,054	0,039	0,050	0,041	0,069	0,052	

M = mean per sample   REF. = reference values
SD = standard deviation per sample   *: discarded data using the test of Grubbs 5 %

REF : Assigned values are robust average values per sample according to algorithm A of
standard ISO 13528, of 10 laboratories, after outliers discarding using Grubbs test at 5 % risk level.

Table IV :   Outlier identification

Sample	11	12	13	14	15	16	17	18	19	20	
Outliers Cochran					10						
Outlier Grubbs					1	9		1			
sr	0,014	0,011	0,009	0,014	0,008	0,008	0,012	0,015	0,012	0,014	
SR	0,062	0,062	0,062	0,062	0,046	0,040	0,051	0,043	0,069	0,053	

Table V :   **ACCURACY - differences (laboratory - reference) in g / 100 g**

Sample\Lab code	11	12	13	14	15	16	17	18	19	20	d	Sd$_{lab}$	t
1	+ 0,019	+ 0,013	- 0,003	+ 0,018	- 0,246	+ 0,004	+ 0,003	+ 0,501	- 0,011	- 0,006	+ 0,029	0,184	0,50
2	- 0,010	- 0,012	- 0,003	- 0,010	- 0,020	- 0,033	- 0,016	- 0,021	- 0,032	- 0,011	- 0,017	0,010	5,38
3	+ 0,025	+ 0,051	+ 0,025	+ 0,027	+ 0,031	- 0,028	- 0,029	+ 0,000	- 0,037	- 0,013	+ 0,005	0,031	0,54
4	- 0,083	- 0,084	- 0,082	- 0,028	- 0,024	- 0,002	- 0,012	- 0,032	- 0,034	- 0,059	- 0,044	0,031	4,51
5	+ 0,078	+ 0,060	+ 0,051	+ 0,048	+ 0,030	+ 0,025	- 0,015	- 0,007	+ 0,015	+ 0,022	+ 0,031	0,029	3,34
6	+ 0,008	+ 0,023	+ 0,008	+ 0,020	+ 0,015	+ 0,013	+ 0,022	+ 0,021	+ 0,041	+ 0,039	+ 0,021	0,011	5,83
7	+ 0,056	+ 0,016	+ 0,030	+ 0,042	+ 0,012	+ 0,021	+ 0,004	+ 0,015	+ 0,003	+ 0,046	+ 0,024	0,018	4,28
8	- 0,067	- 0,053	- 0,033	- 0,098	- 0,103	- 0,072	- 0,097	- 0,092	- 0,121	- 0,119	- 0,085	0,029	9,44
9	- 0,088	- 0,098	- 0,089	- 0,102	- 0,045	+ 0,201	+ 0,096	+ 0,046	+ 0,139	+ 0,002	+ 0,006	0,110	0,17
10	+ 0,062	+ 0,084	+ 0,119	+ 0,085	+ 0,087	+ 0,063	+ 0,042	+ 0,030	+ 0,054	+ 0,049	+ 0,068	0,026	8,10
d	- 0,000	- 0,000	+ 0,002	- 0,000	- 0,002	- 0,001	- 0,000	- 0,004	+ 0,002	- 0,005	+ 0,004	0,079	
Sd	0,061	0,061	0,062	0,061	0,054	0,039	0,050	0,041	0,069	0,052	0,056		

d = mean of differences   Sd = standard deviation of differences   t = Student test - comparison to 0

Upper limits : $\overline{d}$ = +/- 0.100 g / 100g   Sd = 0.100 g / 100g

ISO 22662|IDF 198 : Precision of the method :   Sr = 0.022 g / 100 g
SR = 0.047 g / 100 g

Table VI : **Zscore of the different laboratories for each sample.**
ZS calculated on the PT standard deviation

Sample Lab code	11	12	13	14	15	16	17	18	19	20
1	+0,32	+0,22	-0,05	+0,29	-4,54	+0,10	+0,07	+12,18	-0,16	-0,12
2	-0,16	-0,20	-0,05	-0,16	-0,36	-0,84	-0,31	-0,50	-0,46	-0,20
3	+0,41	+0,83	+0,41	+0,44	+0,58	-0,70	-0,58	+0,01	-0,54	-0,25
4	-1,37	-1,37	-1,34	-0,46	-0,44	-0,05	-0,24	-0,77	-0,49	-1,13
5	+1,28	+0,98	+0,82	+0,78	+0,55	+0,64	-0,30	-0,16	+0,22	+0,43
6	+0,13	+0,37	+0,13	+0,33	+0,28	+0,33	+0,44	+0,52	+0,60	+0,76
7	+0,91	+0,26	+0,48	+0,68	+0,22	+0,53	+0,09	+0,37	+0,05	+0,88
8	-1,10	-0,86	-0,53	-1,60	-1,90	-1,84	-1,94	-2,24	-1,76	-2,29
9	-1,45	-1,60	-1,45	-1,68	-0,84	+5,12	+1,93	+1,13	+2,02	+0,04
10	+1,02	+1,38	+1,93	+1,38	+1,62	+1,62	+0,85	+0,73	+0,78	+0,94

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 2 :
Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation
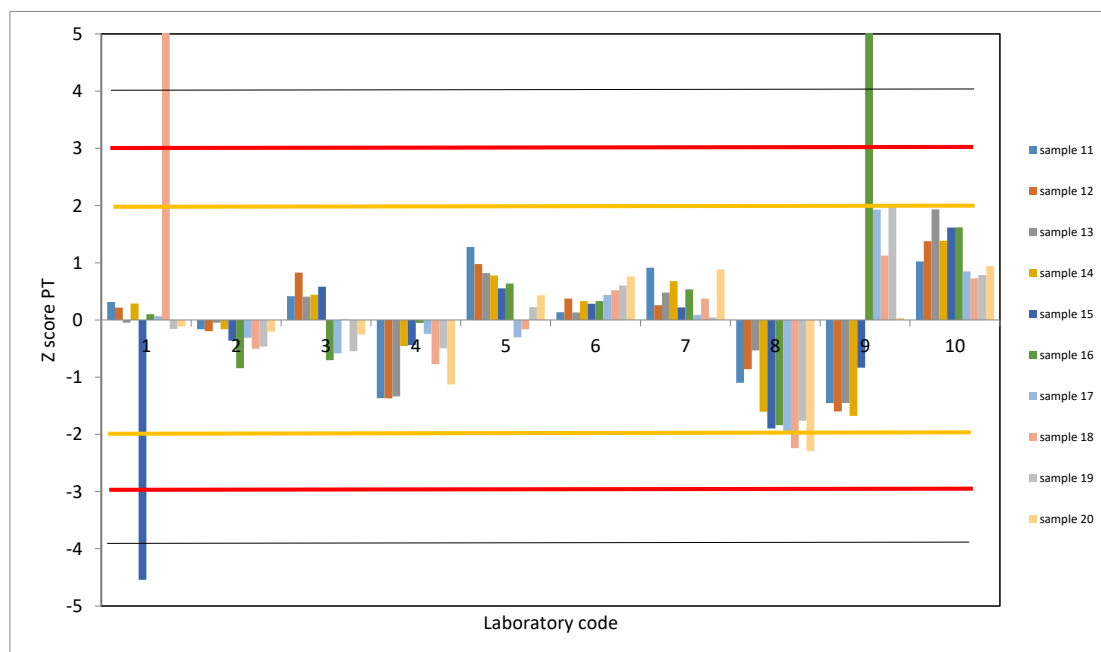
Table VII :   **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample Lab code	11	12	13	14	15	16	17	18	19	20
1	+0,41	+0,28	-0,06	+0,37	-5,23	+0,08	+0,07	+10,66	-0,23	-0,13
2	-0,21	-0,26	-0,06	-0,21	-0,42	-0,70	-0,33	-0,44	-0,68	-0,23
3	+0,54	+1,08	+0,53	+0,58	+0,67	-0,59	-0,62	+0,01	-0,79	-0,28
4	-1,77	-1,79	-1,75	-0,59	-0,50	-0,04	-0,26	-0,67	-0,72	-1,25
5	+1,65	+1,27	+1,08	+1,01	+0,64	+0,53	-0,32	-0,14	+0,32	+0,48
6	+0,17	+0,49	+0,17	+0,43	+0,33	+0,28	+0,47	+0,45	+0,88	+0,84
7	+1,19	+0,34	+0,63	+0,88	+0,25	+0,45	+0,09	+0,33	+0,07	+0,98
8	-1,42	-1,12	-0,70	-2,08	-2,18	-1,53	-2,07	-1,96	-2,57	-2,53
9	-1,88	-2,09	-1,90	-2,18	-0,96	+4,28	+2,05	+0,99	+2,95	+0,04
10	+1,32	+1,79	+2,53	+1,80	+1,86	+1,35	+0,90	+0,64	+1,14	+1,04

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation
has always the value of SR of the method SR=0,047

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 3 :
Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method

ICAR Interlaboratory Proficiency Study - March 2023
Trial of : 06/03/2023

2 Labs OUT OF THE TARGET (20 %)

Sd

1 9

10 laboratories
10 samples

Student 5 %   Student 5 %

Target limits : $\overline{d}$ = +/- 0.100 g of lactose monohydrate / 100 g of milk
Sd =   0.100 g of lactose monohydrate / 100 g of milk
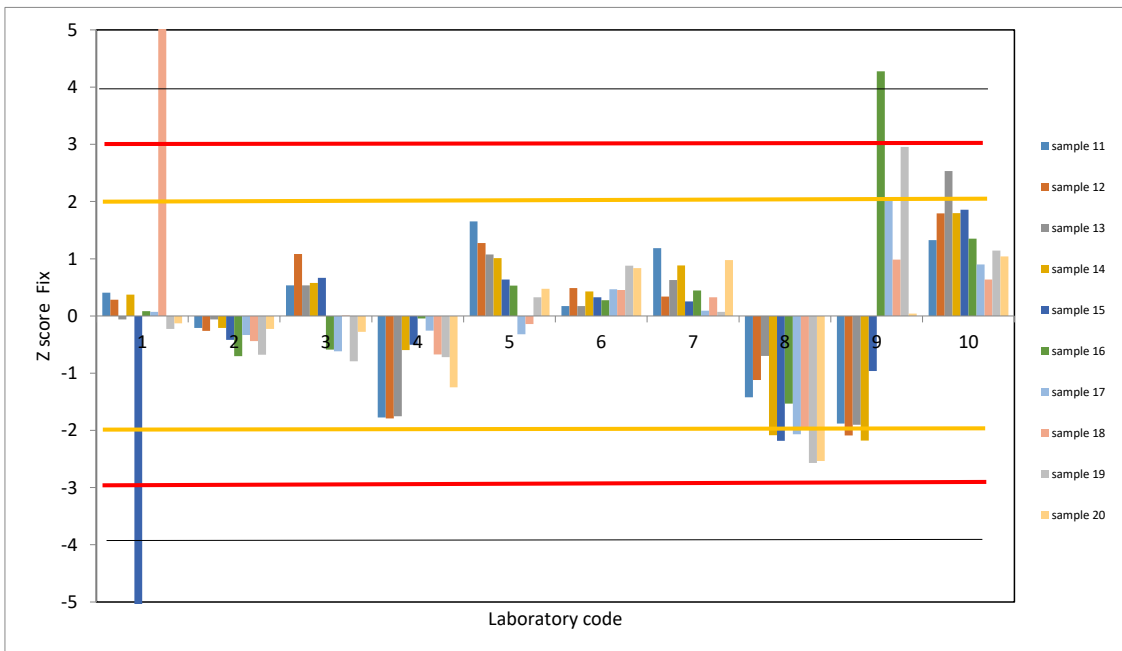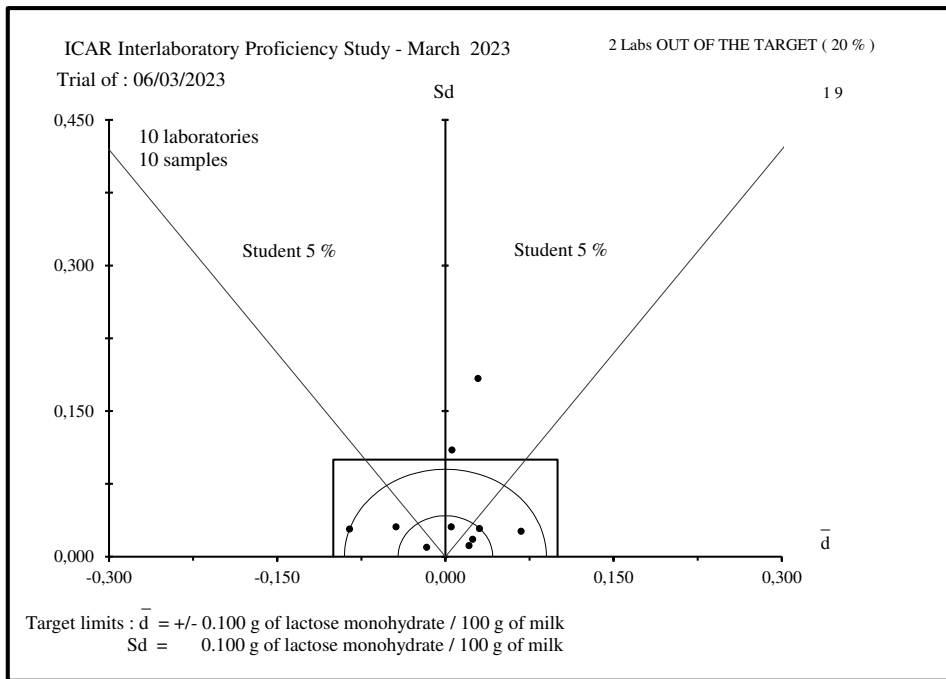
Figure 1 :   ACCURACY - Evaluation of the individual performances (to see table I).

ICAR

PROFICIENCY TESTING SCHEME

March 2023

Raw Milk

Determination of UREA CONTENT

Sending date of statistical treatment :   24th March 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)		
ICAR Staff	Silvia Orlandini	pt@icar.org	silvia@icar.org

ACCRÉDITATION
N° 1-2473
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Table I :   **Ranking of the laboratories**   <u>Units : mg / dl</u>

Nb	%	N°	d	Sd	D	Method
1	11	6	- 0,44	0,30	0,53	ISO 14637 / IDF 195
2	22	2	- 0,51	0,41	0,66	ISO 14637 / IDF 195
3	33	5	+ 0,61	0,43	0,75	Skalar 612-322
4	44	1	- 0,54	0,61	0,81	ISO 14637 / IDF 195
5	56	7	- 0,60	0,55	0,82	ISO 14637 / IDF 195
6	67	3	- 0,18	1,42	1,43	ISO 14637 / IDF 195
7	78	4	+ 1,16	1,67	2,03	ISO 14637 / IDF 195
8	89	9	- 1,90	1,69	2,54	Enzymatic method in house
9	100	8	+ 2,90	0,79	3,01	ISO 14637 / IDF 195

The table should be studied in parallel with figure 1 where the laboratories are located according to an acceptability area (or target) the limits of which are :

$$+/-\ 2{,}50 \text{ mg / dl for } \bar{d} \text{ and } 1{,}50 \text{ mg / dl for Sd}$$

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 7 laboratories using reference method (ISO 14637|IDF 195 or V 04-217), after outlier discarding using Grubbs test at 5% risk level

(NC : OUT of RANKING because of insufficient data number)

(Nb : laboratory rank;   % : relative rank)

(N° : laboratory identification number)

(d et Sd : mean and standard deviation of the differences (laboratory -reference))

(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

<u>Note</u> :   Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation.

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %) Sr_{PT} 0,43

Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %) SR_{PT} 1,44

Table II :   **REPEATABILITY - Absolute difference between replicates in mg / dl**

Sample\Lab code	21	22	23	24	25	26	27	28	29	30	Sr	NL
1	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,00	20
2	0,400	0,370	0,060	0,150	0,060	0,000	0,050	0,830	0,310	0,150	0,24	20
3	0,040	0,070	0,350	0,130	0,520	0,480	0,000	0,060	0,390	0,230	0,21	20
4	0,500	1,100	1,700	2,000 *	1,000	3,200 *	2,100 *	0,700	3,300 *	1,500	1,37	20
5	0,010	0,400	0,650	0,480	0,420	0,880	0,010	0,060	0,090	0,310	0,31	20
6	0,120	0,780	0,480	0,840	0,120	1,010	0,050	0,430	0,060	0,540	0,39	20
7	0,300	0,300	1,100	0,100	0,700	0,600	1,100	0,400	0,400	1,200	0,51	20
8	1,400 *	0,100	0,200	1,000	1,100	0,200	0,300	0,600	0,900	0,500	0,54	20
9	0,010	0,100	0,620	0,030	0,660	0,050	0,890	1,160	0,980	0,290	0,45	20
Sr	0,37	0,35	0,54	0,58	0,45	0,84	0,60	0,42	0,85	0,50		180
NE	18	18	18	18	18	18	18	18	18	18		
L	0,59	1,19	1,84	1,16	1,52	1,28	1,19	1,44	1,22	1,69		

Sr : repeatability standard deviation of each laboratory limit 0,54 mg/dl

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.

SE : repeatability standard deviation per sample

NE : number of measurements per sample

*: discarded data using the test of Cochran at 5 %

** : missing data

r : limit of repeatability, absolute difference betwen two replicates=1,50 according ISO 14637|IDF 195

Table III :   **Means of the replicates in mg / dl**

Sample/Lab code	21	22	23	24	25	26	27	28	29	30
1	19,09	42,47	28,31	33,46	37,54	46,76	23,60	51,48	56,41	61,13
2	18,79	42,11	27,79	33,03	37,81	46,89	23,48	52,22	56,70	61,70
3	20,57 *	43,64	29,58	34,47	37,48	46,48	24,23	52,25	55,64	59,53
4	18,45	42,85	27,85	33,20	38,30	52,20	24,75	55,25	60,25	64,15
5	19,30	43,69	29,26	34,11	38,95	48,11	23,90	53,32	57,87	63,26
6	18,25	41,68	28,19	33,45	37,88	47,19	23,49	52,58	57,06	61,49
7	18,25	42,45	28,65	32,65	37,95	46,90	23,65	51,40	56,90	60,80
8	23,30 *	45,45	31,40	35,80	40,15 ᵏ	49,90	27,15 *	56,60	60,65	64,25
9	18,87	41,89	27,33	32,25	37,80	45,54	22,67	48,84	54,25	57,22
M	18,71	42,91	28,71	33,60	37,96	47,77	23,72	52,66	57,30	61,50
REF.	18,57	42,79	28,65	33,61	37,83	47,72	23,85	53,07	57,66	61,86
SD	0,41	1,18	1,24	1,07	0,47	2,06	0,61	2,25	2,05	2,25

M = mean per sample   REF. = reference values
SD = standard deviation per sample   *: discarded data using the test of Grubbs 5 %

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528,
of 7 laboratories using the reference method ISO 14637│IDF 195 or V 04-2017, after outliers discarging using
Grubbs test 5% risk level

Table IV :   Outlier identification

Sample	21		22		23		24		25		26		27		28		29		30	
Outliers Cochran	8						4				5		4				4				
Outlier Grubbs	3; 8								8				8								
sr	0,19		0,35		0,54		0,35		0,39		0,39		0,38		0,42		0,37		0,50	
SR	0,43		1,21		1,29		1,16		0,55		1,33		0,55		2,27		1,87		2,28	

Table V :   **ACCURACY - differences (laboratory - reference) in mg / dl**

Sample\Lab code	21	22	23	24	25	26	27	28	29	30	d	Sd$_{lab}$	t
1	+ 0,52	- 0,32	- 0,34	- 0,15	- 0,29	- 0,96	- 0,26	- 1,59	- 1,24	- 0,73	- 0,54	0,61	2,79
2	+ 0,22	- 0,69	- 0,86	- 0,59	- 0,02	- 0,83	- 0,38	- 0,86	- 0,96	- 0,17	- 0,51	0,41	3,96
3	+ 2,00	+ 0,84	+ 0,92	+ 0,85	- 0,35	- 1,24	+ 0,38	- 0,82	- 2,02	- 2,34	- 0,18	1,42	0,40
4	- 0,12	+ 0,06	- 0,80	- 0,41	+ 0,47	+ 4,48	+ 0,90	+ 2,18	+ 2,59	+ 2,29	+ 1,16	1,67	2,20
5	+ 0,73	+ 0,90	+ 0,60	+ 0,50	+ 1,12	+ 0,39	+ 0,04	+ 0,25	+ 0,21	+ 1,39	+ 0,61	0,43	4,52
6	- 0,32	- 1,11	- 0,46	- 0,16	+ 0,05	- 0,54	- 0,37	- 0,50	- 0,60	- 0,37	- 0,44	0,30	4,54
7	- 0,32	- 0,34	- 0,00	- 0,96	+ 0,12	- 0,82	- 0,20	- 1,67	- 0,76	- 1,06	- 0,60	0,55	3,44
8	+ 4,73	+ 2,66	+ 2,75	+ 2,19	+ 2,32	+ 2,18	+ 3,30	+ 3,53	+ 2,99	+ 2,39	+ 2,90	0,79	11,60
9	+ 0,30	- 0,90	- 1,32	- 1,37	- 0,03	- 2,19	- 1,19	- 4,23	- 3,41	- 4,65	- 1,90	1,69	3,54
d	+ 0,15	+ 0,12	+ 0,05	- 0,01	+ 0,14	+ 0,05	- 0,13	- 0,42	- 0,36	- 0,36	+ 0,06	1,62	
Sd	0,41	1,18	1,24	1,07	0,47	2,06	0,61	2,25	2,05	2,25	1,53		

d = mean of differences   Sd = standard deviation of differences   t = Student test - comparison to 0

Upper limits : $\overline{d}$ = +/- 2,50 mg / dl   Sd = 1,50 mg / dl

ISO 14637│IDF 195 :   Precision of the method :   Sr = 0.54 mg / dl
SR = 1.81 mg / dl

Table VI :   **Zscore of the different laboratories for each sample.**
                            ZS calculated on the PT standard deviation

Sample\Lab Code	21	22	23	24	25	26	27	28	29	30
1	+1,28	-0,27	-0,27	-0,14	-0,61	-0,47	-0,42	-0,71	-0,61	-0,32
2	+0,55	-0,58	-0,70	-0,55	-0,03	-0,41	-0,62	-0,38	-0,47	-0,07
3	+4,89	+0,71	+0,75	+0,80	-0,73	-0,61	+0,62	-0,37	-0,99	-1,04
4	-0,28	+0,05	-0,65	-0,39	+1,00	+2,18	+1,47	+0,97	+1,26	+1,02
5	+1,78	+0,76	+0,49	+0,46	+2,38	+0,19	+0,07	+0,11	+0,10	+0,62
6	-0,77	-0,94	-0,37	-0,15	+0,11	-0,26	-0,60	-0,22	-0,29	-0,17
7	-0,77	-0,29	-0,00	-0,90	+0,26	-0,40	-0,33	-0,74	-0,37	-0,47
8	+11,55	+2,25	+2,23	+2,05	+4,92	+1,06	+5,41	+1,56	+1,46	+1,06
9	+0,73	-0,76	-1,07	-1,28	-0,06	-1,06	-1,95	-1,88	-1,66	-2,06

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 2 :
Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation
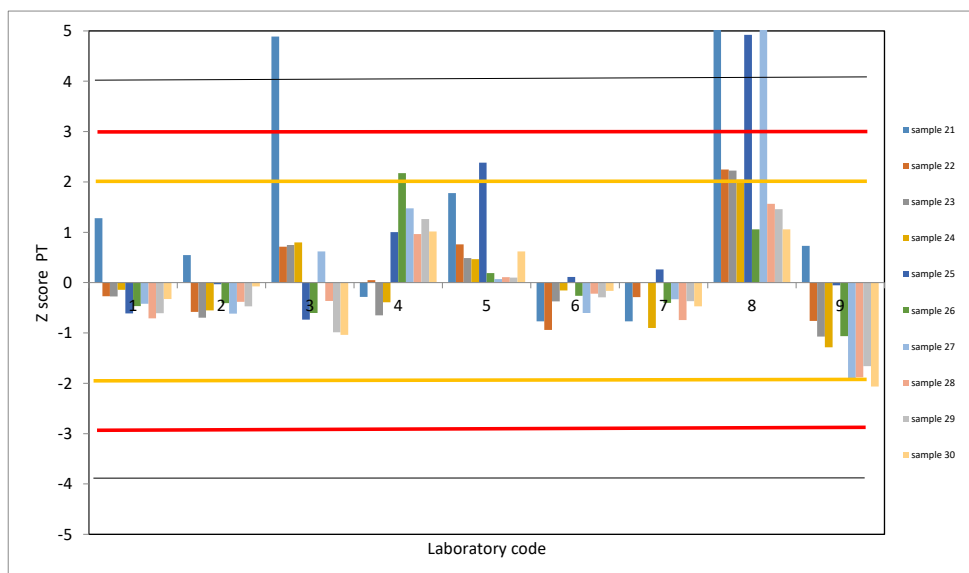
Table VII :   **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample\Lab code	21	22	23	24	25	26	27	28	29	30
1	+0,29	-0,18	-0,19	-0,08	-0,16	-0,53	-0,14	-0,88	-0,69	-0,40
2	+0,12	-0,38	-0,48	-0,33	-0,01	-0,46	-0,21	-0,47	-0,53	-0,09
3	+1,11	+0,47	+0,51	+0,47	-0,19	-0,69	+0,21	-0,46	-1,12	-1,29
4	-0,06	+0,03	-0,44	-0,23	+0,26	+2,47	+0,50	+1,20	+1,43	+1,26
5	+0,40	+0,50	+0,33	+0,27	+0,62	+0,21	+0,02	+0,14	+0,11	+0,77
6	-0,17	-0,61	-0,25	-0,09	+0,03	-0,30	-0,20	-0,28	-0,33	-0,21
7	-0,17	-0,19	-0,00	-0,53	+0,07	-0,46	-0,11	-0,93	-0,42	-0,59
8	+2,62	+1,47	+1,52	+1,21	+1,28	+1,20	+1,82	+1,95	+1,65	+1,32
9	+0,17	-0,50	-0,73	-0,76	-0,01	-1,21	-0,66	-2,34	-1,88	-2,57

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation has always the value of SR of the method SR=1,81

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 3 :
Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method

Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**

ICAR
PROFICIENCY TESTING SCHEME

March 2023

Raw Milk

Enumeration of SOMATIC CELLS

Sending date of statistical treatment :   24th March 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)		
ICAR Staff	Silvia Orlandini	pt@icar.org	silvia@icar.org
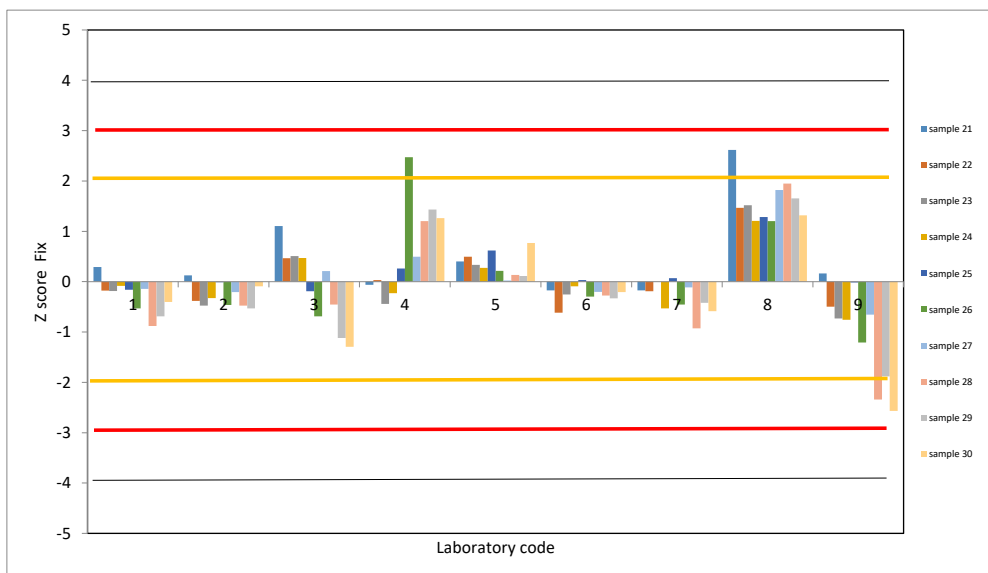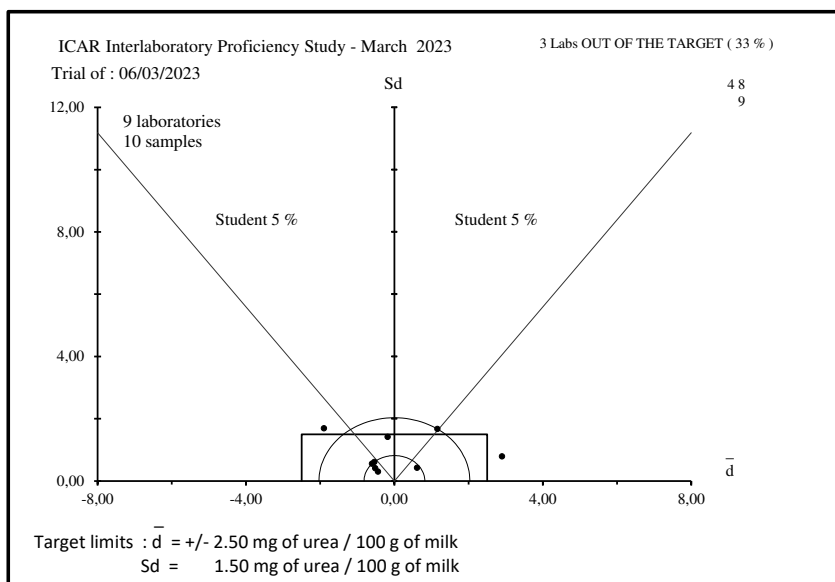
Proficiency test accreditated ISO 17043

ACCRÉDITATION
N° 1-2473
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DISPONIBLE SUR
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Table I :   **Ranking of the laboratories in %**

Nb	%	N°	d	Sd	D	Method
1	1	56	+ 1%	1%	1%	B
2	3	26	- 1%	1%	1%	B
3	4	10	+ 0%	1%	1%	B
4	6	36	+ 0%	1%	1%	B
5	7	21	- 0%	1%	1%	B
6	9	9	+ 0%	1%	1%	B
7	10	28	- 1%	1%	1%	B
8	12	4	+ 1%	1%	1%	B
9	13	23	+ 1%	1%	2%	B
10	14	25	+ 1%	2%	2%	B
11	16	7	- 1%	2%	2%	B
12	17	20	- 1%	2%	2%	B
13	19	32	+ 1%	2%	2%	B
14	20	43	- 1%	2%	2%	B
15	22	67	+ 0%	2%	2%	B
16	23	12	+ 0%	2%	2%	B
17	25	31	- 0%	2%	2%	B
18	26	29	+ 1%	2%	2%	B
19	28	14	+ 1%	2%	2%	B
20	29	69	+ 1%	2%	3%	B
21	30	58	+ 2%	2%	3%	B
22	32	18	- 1%	3%	3%	B
23	33	8	- 2%	2%	3%	B
24	35	11	+ 2%	3%	3%	B
25	36	27	- 3%	2%	3%	B
26	38	63	- 2%	3%	3%	B
27	39	66	+ 3%	2%	4%	B
28	41	68	- 3%	3%	4%	B
29	42	5	+ 3%	3%	4%	B
30	43	30	- 3%	3%	4%	B

Nb	%	N°	d	Sd	D	Method
31	45	42	+ 3%	3%	4%	B
32	46	64	+ 3%	3%	4%	B
33	48	62	+ 4%	3%	5%	B
34	49	65	+ 2%	5%	5%	B
35	51	59	- 0%	5%	5%	B
36	52	13	+ 3%	4%	5%	B
37	54	35	- 4%	4%	5%	B
38	55	22	+ 4%	4%	6%	B
39	57	2	+ 4%	4%	6%	B
40	58	60	- 2%	6%	6%	B
41	59	33	+ 5%	4%	6%	B
42	61	50	+ 2%	6%	6%	B
43	62	40	- 4%	5%	7%	B
44	64	19	- 5%	6%	7%	B
45	65	52	+ 4%	6%	8%	B
46	67	57	+ 6%	5%	8%	B
47	68	24	- 5%	6%	8%	B
48	70	34	+ 6%	5%	8%	B
49	71	3	+ 6%	6%	8%	B
50	72	6	- 6%	6%	9%	B
51	74	61	- 6%	6%	9%	B
52	75	51	- 7%	6%	10%	B
53	77	55	- 7%	7%	10%	B
54	78	41	- 7%	7%	10%	B
55	80	53	+ 7%	7%	10%	B
56	81	39	- 6%	8%	10%	B
57	83	44	+ 10%	7%	12%	A
58	84	49	+ 9%	8%	12%	B
59	86	47	- 10%	8%	12%	B
60	87	45	+ 10%	8%	13%	B
61	88	46	- 10%	8%	13%	B
62	90	38	- 9%	10%	13%	B
63	91	37	- 11%	10%	15%	B
64	93	54	+ 11%	13%	17%	B
65	94	15	+ 13%	11%	17%	B
66	96	48	- 10%	15%	18%	B
67	97	16	+ 15%	13%	20%	B
68	99	17	- 14%	16%	22%	A
69	100	1	- 78%	64%	101%	A

(NC : OUT of RANKING because of insufficient data number)
(Nb : laboratory rank;   % : relative rank)
(N° : laboratory identification number)
(d et Sd : mean and standard deviation of the differences (laboratory -reference))
(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

The table should be studied in parallel with figure 1 where the
laboratories are located according to an acceptability area (or target)
the limits of which are :

$\overline{}$
+/- 10% for d and 10% for Sd

A	ISO 13366-1 │ IDF 148-1
B	ISO 13366-2 │ IDF 148-2

REF : Assigned values are robust average values per sample according to
algorithm A of standard ISO 13528, of 68 laboratories using reference metod
ISO 13366-1│IDF 148-1 and alternative method ISO 13366-2│IDF 148-2

after outlier discarding using Grubbs test at 5% risk level

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %)		Sr$_{PT}$	12	2%
Reproducibilit Note : Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation.		SR$_{PT}$	48	8%

Table II :   **REPEATABILITY - Absolute difference between replicates in 10 ^{3} cells / ml**

Sample/Lab code	31	32	33	34	35	36	37	38	39	40	Sr	NL
1	8	1	3	4	4	14	3	9	6	6	5	20
2	9	39	14	24	14	47	32	42	3	2	19	20
3	11	7	4	8	5	12	10	17	0	9	7	20
4	17	6	9	8	4	30	4	16	0	3	9	20
5	2	39	13	14	17	5	23	12	5	7	12	20
6	34	20	2	10	2	9	30	13	0	1	12	20
7	28	21	31	18	9	27	8	9	3	2	13	20
8	43	31	6	18	16	12	22	1	4	6	14	20
9	32	27	22	22	3	6	19	7	4	9	13	20
10	13	2	7	17	9	13	9	11	2	1	7	20
11	11	7	0	13	1	15	12	19	0	0	7	20
12	10	14	5	2	34 *	37	4	7	1	2	12	20
13	2	18	0	25	6	100 *	17	6	1	7	24	20
14	27	11	6	32	4	47	4	14	0	4	15	20
15	11	4	5	5	6	11	0	8	2	2	5	20
16	17	29	2	11	1	28	13	5	1	0	11	20
17	6	17	10	8	12	40	27	4	2	5	12	20
18	6	26	6	15	24	9	41	4	11	6	13	20
19	15	32	5	3	3	14	53	5	1	7	15	20
20	42	34	12	8	10	33	9	2	1	8	15	20
21	2	39	0	53 *	4	8	6	1	6	5	15	20
22	6	21	18	4	5	1	15	22	3	7	9	20
23	2	4	4	5	3	15	9	4	5	3	5	20
24	10	10	3	2	8	13	15	10	1	3	6	20
25	9	8	4	9	1	14	13	18	2	5	7	20
26	5	24	3	3	15	22	25	6	0	2	10	20
27	11	20	8	2	2	25	9	10	1	1	8	20
28	15	9	8	11	13	17	8	0	4	5	7	20
29	29	34	29	2	7	16	3	2	2	17	13	20
30	26	14	2	23	11	5	7	1	1	13	9	20

Table II :   **REPEATABILITY - Absolute difference between replicates in 10^3 cells / ml**

Sample Lab code	31	32	33	34	35	36	37	38	39	40	Sr	NL
31	23	43	8	13	5	5	20	13	2	5	13	20
32	5	0	10	5	1	14	4	22	4	0	7	20
33	92 *	11	0	11	8	2	12	6	4	7	21	20
34	9	33	4	4	1	27	9	17	2	2	11	20
35	24	65	5	13	11	38	31	5	9	2	20	20
36	25	6	7	1	1	15	26	1	3	6	9	20
37	10	14	14	4	17	28	29	41	4	10	15	20
38	29	31	1	7	6	17	7	6	4	3	11	20
39	7	38	20	26	1	49	24	7	2	9	17	20
40	25	32	3	5	3	0	32	11	6	5	12	20
41	6	37	3	16	5	11	11	5	0	4	10	20
42	3	0	0	0	0	1	1	1	1	0	1	20
43	2	7	3	3	3	2	0	6	2	3	3	20
44	10	48	3	2	7	44	26	4	3	1	16	20
45	15	14	20	0	3	32	24	3	3	2	11	20
46	17	23	7	12	1	29	6	5	3	1	10	20
47	1	38	4	6	3	21	7	3	2	1	10	20
48	80 *	53	31	55 *	56 *	81	106 *	7	10	29 *	42	20
49	50	3	7	8	12	4	6	13	2	13	13	20
50	9	48	4	36	12	30	21	26	3	2	17	20
51	8	4	20	18	34 *	90	26	9	12	12	24	20
52	50	119 *	16	38	3	58	37	25	1	**	36	18
53	94 *	101 *	1	14	7	73	16	37	3	5	36	20
54	4	16	9	1	3	13	4	13	1	2	6	20
55	17	1	14	1	10	12	21	6	4	7	8	20
56	23	38	8	16	9	17	30	3	5	16	14	20
57	3	32	3	1	5	17	2	10	0	2	9	20
58	0	0	7	2	8	33	9	27	5	6	10	20
59	9	0	1	4	10	9	0	2	1	1	4	20
60	5	3	0	1	1	5	4	7	0	0	3	20
61	160 *	13	20	7	1	50	2	29	2	0	38	20
62	36	16	6	33	21	41	21	24	1	5	17	20
63	17	13	8	7	21	0	27	8	10	8	10	20
64	24	21	5	4	3	4	4	12	0	1	8	20
65	3	27	11	1	1	15	1	28	4	2	10	20
66	13	5	25	1	13	4	6	13	4	10	8	20
67	14	0	5	1	9	18	19	19	3	3	8	20
68	0	3	0	7	5	14	4	5	0	0	4	20
69	2	16	21	23	8	21	13	10	1	10	10	20
Sr	23	22	8	12	9	22	16	10	3	5		1378
r	126	126	42	50	42	126	63	63	25	25		
NE	138	138	138	138	138	138	138	138	138	136		
L	61	80	36	44	28	93	59	47	13	20		

Sr : repeatability standard deviation of each laboratory limit : **C**f up down

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.

SE : repeatability standard deviation per sample

NE   : number of measurements per sample

*: discarded data using the test of Cochran at 5 %

** : missing data

r : limit of repeatability, absolute difference betwen two replicates according ISO 13366-2 / IDF 148-2 : Cf up down

Level 10.^{3} / ml	Sr %	r
150	6	25
200	5	42
450	4	50
750	3	63
1500	3	126

Table III :   **Means of the replicates in 10³ cells / ml**

Sample Lab code	31	32	33	34	35	36	37	38	39	40
1	195 *	263 *	54 *	114 *	42 *	332 *	158 *	140 *	18 *	20 *
2	1063	1290	303	434	198	1519	766	591	45	91
3	1109	1239	296	441	204	1570	803	586	44	94
4	1050	1228	286	422	180	1464	758	567	42	87
5	1043	1275	286	432	192	1497	775	559	49	94
6	953	1142	278	395	177	1362	694	531	39	82
7	1016	1204	284	408	187	1449	726	566	46	89
8	1015	1191	272	411	178	1430	731	532	43	93
9	1038	1238	282	418	184	1465	743	565	44	89
10	1024	1232	284	417	192	1462	745	556	48	91
11	1052	1256	291	423	189	1494	749	570	47	93
12	1013	1233	287	440	182	1473	747	558	45	85
13	1030	1201	306	453	191	1516	783	604	47	92
14	1028	1240	286	436	188	1481	738	576	39	93
15	1185	1384	314	477	213	1647	836	636	51	99
16	1211	1406	323	475	209	1668	866	617	52	100
17	1003	1167	272	323 *	168	1140	553 *	446	34	77
18	996	1248	276	413	196	1443	743	549	45	87
19	1029	1145	274	400	192	1358	705	518	47	95
20	1016	1207	291	419	181	1431	758	555	46	93
21	1031	1203	293	411	184	1454	745	561	47	86
22	1080	1281	296	429	200	1521	771	575	46	99
23	1041	1238	287	428	192	1458	766	554	43	93
24	1026	1196	278	386	179	1334	667	537	41	91
25	1048	1232	279	428	181	1471	743	551	43	97
26	1024	1224	280	409	183	1451	747	557	43	85
27	1011	1200	271	411	181	1411	727	538	47	89
28	1022	1207	282	424	184	1446	737	550	41	91
29	1052	1243	277	427	189	1484	743	565	48	95
30	1004	1177	270	415	184	1403	738	532	43	86

M = mean per sample   REF. = reference values

SD = standard deviation per sample   *: discarded data using the test of Grubbs 5 %

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528,
of 68 laboratories using the reference method ISO 13366│IDF 148-1 and alternative method ISO 13366-2│IDF 148-2,
after outlier discarding using Grubbs test at 5% risk level

Table IV :   Outlier identification

Sample	31	32	33	34	35	36	37	38	39	40
Outliers Cochran	33; 48 53; 61	52; 53		21; 48	12; 48 51	13	48			48
Outlier Grubbs	1	1	1	1; 17 54	1; 54	1	1; 17	1	1	1; 52
sr	14	18	8	10	6	21	13	10	3	4
SR	55	74	21	24	12	98	47	41	5	7
sr %	1%	1%	3%	2%	3%	1%	2%	2%	6%	5%
SR %	5%	6%	7%	6%	6%	7%	6%	7%	11%	8%

Table III :   **Means of the replicates in 10^3 cells / ml**

Sample Lab code	31	32	33	34	35	36	37	38	39	40	
31	1018	1198	298	422	197	1433	739	579	48	93	
32	1049	1232	279	413	191	1482	746	567	44	94	
33	1109	1266	286	435	194	1509	779	600	43	95	
34	1101	1288	302	455	201	1550	795	597	47	95	
35	1038	1192	268	402	171	1375	701	531	38	84	
36	1040	1240	284	421	190	1450	753	557	45	90	
37	964	1064	238	379	164	1269	664	496	37	75	
38	929	1049	245	407	170	1325	692	563	46	94	
39	1055	1175	273	375	172	1302	662	507	43	91	
40	999	1151	265	424	182	1357	729	540	46	95	
41	1001	1123	253	391	180	1318	700	518	47	83	
42	1068	1271	292	432	193	1497	761	582	45	91	
43	1025	1201	290	416	196	1427	752	548	52	97	
44	1139	1327	334	451	203	1551	828	640	56	98	
45	1131	1343	318	458	206	1579	847	628	47	96	
46	933	1092	252	378	167	1317	663	496	41	80	
47	947	1094	255	374	169	1317	685	494	41	81	
48	963	1213	219	364	185	1166	722	432	35	111	
49	1138	1330	297	460	196	1592	806	620	47	96	
50	1003	1250	280	427	191	1555	740	574	42	88	
51	978	1117	265	382	181	1347	688	512	44	80	
52	1127	1287	284	437	197	1516	769	579	45	58 *	
53	1154	1337	306	448	194	1501	806	598	52	92	
54	1023	1455	342	509 *	229 *	1436	880	670	57	110	
55	952	1132	270	406	177	1335	705	504	51	98	
56	1036	1232	285	417	188	1459	755	564	50	98	
57	1105	1236	301	450	197	1554	789	597	45	101	
58	1054	1245	287	424	195	1481	763	579	45	92	
59	1047	1148	281	391	199	1500	737	585	48	94	
60	1034	1122	269	387	183	1490	718	555	45	93	
61	1023	1145	269	405	168	1335	681	528	41	85	
62	1063	1231	301	445	198	1519	773	589	48	99	
63	1012	1203	269	422	183	1404	726	543	46	96	
64	1087	1244	289	425	189	1505	770	563	44	94	
65	1037	1227	280	409	189	1543	764	560	49	92	
66	1047	1260	288	427	197	1491	774	587	52	101	
67	1039	1232	264	428	193	1476	733	556	39	93	
68	981	1181	276	401	190	1444	727	550	39	90	
69	1061	1222	267	421	195	1447	768	587	51	95	
M	1040	1222	283	419	188	1448	748	560	45	92	
REF.	1037	1219	282	419	188	1451	746	560	45	92	
SD	55	74	20	24	11	97	45	41	4	7	
AVT	1004	1193	274	414	180	1422	735	548	40	86	

M = mean per sample   REF. = reference values

SD = standard deviation per sample   *: discarded data using the test of Grubbs 5 %

AVT = Assign value traceable to the ERM BD001

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528,
of 68 laboratories using the reference method ISO 13366│IDF 148-1 and alternative method ISO 13366-2│IDF 148-2,
after outlier discarding using Grubbs test at 5% risk level

Table IV :   Outlier identification

Sample	31	32	33	34	35	36	37	38	39	40		
Outliers Cochran	33; 48 53; 61	52; 53		21; 48	12; 48 51	13	48			48		
Outlier Grubbs	1	1	1	1; 17 54	1; 54	1	1; 17	1	1	1; 52		
sr	14	18	8	10	6	21	13	10	3	4		
SR	55	74	21	24	12	98	47	41	5	7		
sr %	1%	1%	3%	2%	3%	1%	2%	2%	6%	5%		
SR %	5%	6%	7%	6%	6%	7%	6%	7%	11%	8%		
SR Method for AVT values	60	72	22	30	16	86	45	37	4	8		

Table V :　　　**ACCURACY - differences (laboratory - reference) in %**

Sample Lab code	31	32	33	34	35	36	37	38	39	40	d	Sd$_{lab}$	t
1	- 81%	- 78%	- 81%	- 73%	- 78%	- 77%	- 79%	- 75%	- 60%	- 78%	- 78%	64%	3,83
2	+ 2%	+ 6%	+ 7%	+ 3%	+ 5%	+ 5%	+ 3%	+ 5%	- 1%	- 1%	+ 4%	4%	3,28
3	+ 7%	+ 2%	+ 5%	+ 5%	+ 8%	+ 8%	+ 8%	+ 4%	- 2%	+ 2%	+ 6%	6%	2,90
4	+ 1%	+ 1%	+ 1%	+ 1%	- 4%	+ 1%	+ 2%	+ 1%	- 7%	- 6%	+ 1%	1%	1,76
5	+ 1%	+ 5%	+ 1%	+ 3%	+ 2%	+ 3%	+ 4%	- 0%	+ 8%	+ 2%	+ 3%	3%	2,49
6	- 8%	- 6%	- 2%	- 6%	- 6%	- 6%	- 7%	- 5%	- 13%	- 11%	- 6%	6%	3,62
7	- 2%	- 1%	+ 0%	- 3%	- 1%	- 0%	- 3%	+ 1%	+ 1%	- 3%	- 1%	2%	2,30
8	- 2%	- 2%	- 4%	- 2%	- 5%	- 1%	- 2%	- 5%	- 4%	+ 1%	- 2%	2%	4,39
9	+ 0%	+ 2%	- 0%	- 0%	- 2%	+ 1%	- 0%	+ 1%	- 2%	- 4%	+ 0%	1%	0,96
10	- 1%	+ 1%	+ 0%	- 1%	+ 2%	+ 1%	- 0%	- 1%	+ 7%	+ 0%	+ 0%	1%	0,30
11	+ 1%	+ 3%	+ 3%	+ 1%	+ 0%	+ 3%	+ 0%	+ 2%	+ 4%	+ 1%	+ 2%	3%	2,53
12	- 2%	+ 1%	+ 1%	+ 5%	- 3%	+ 1%	+ 0%	- 1%	- 1%	- 7%	+ 0%	2%	0,48
13	- 1%	- 1%	+ 8%	+ 8%	+ 2%	+ 4%	+ 5%	+ 8%	+ 3%	- 0%	+ 3%	4%	2,19
14	- 1%	+ 2%	+ 1%	+ 4%	+ 0%	+ 2%	- 1%	+ 3%	- 13%	+ 1%	+ 1%	2%	1,51
15	+ 14%	+ 14%	+ 11%	+ 14%	+ 13%	+ 13%	+ 12%	+ 13%	+ 13%	+ 8%	+ 13%	11%	3,71
16	+ 17%	+ 15%	+ 14%	+ 13%	+ 11%	+ 15%	+ 16%	+ 10%	+ 14%	+ 9%	+ 15%	13%	3,53
17	- 3%	- 4%	- 4%	- 23%	- 11%	- 21%	- 26%	- 20%	- 24%	- 17%	- 14%	16%	2,75
18	- 4%	+ 2%	- 2%	- 2%	+ 4%	- 1%	- 0%	- 2%	- 1%	- 5%	- 1%	3%	0,84
19	- 1%	- 6%	- 3%	- 5%	+ 2%	- 6%	- 6%	- 8%	+ 3%	+ 3%	- 5%	6%	2,61
20	- 2%	- 1%	+ 3%	- 0%	- 4%	- 1%	+ 2%	- 1%	+ 1%	+ 1%	- 1%	2%	1,28
21	- 1%	- 1%	+ 4%	- 2%	- 2%	+ 0%	- 0%	+ 0%	+ 4%	- 7%	- 0%	1%	1,15
22	+ 4%	+ 5%	+ 5%	+ 2%	+ 6%	+ 5%	+ 3%	+ 3%	+ 1%	+ 7%	+ 4%	4%	3,35
23	+ 0%	+ 2%	+ 2%	+ 2%	+ 2%	+ 0%	+ 3%	- 1%	- 6%	+ 1%	+ 1%	1%	2,18
24	- 1%	- 2%	- 2%	- 8%	- 5%	- 8%	- 11%	- 4%	- 10%	- 1%	- 5%	6%	2,54
25	+ 1%	+ 1%	- 1%	+ 2%	- 4%	+ 1%	- 0%	- 2%	- 4%	+ 5%	+ 1%	2%	1,00
26	- 1%	+ 0%	- 1%	- 3%	- 3%	- 0%	+ 0%	- 1%	- 4%	- 7%	- 1%	1%	2,32
27	- 3%	- 2%	- 4%	- 2%	- 4%	- 3%	- 3%	- 4%	+ 3%	- 4%	- 3%	2%	3,96
28	- 1%	- 1%	- 0%	+ 1%	- 2%	- 0%	- 1%	- 2%	- 9%	- 1%	- 1%	1%	3,13
29	+ 1%	+ 2%	- 2%	+ 2%	+ 0%	+ 2%	- 0%	+ 1%	+ 7%	+ 3%	+ 1%	2%	2,07
30	- 3%	- 3%	- 4%	- 1%	- 2%	- 3%	- 1%	- 5%	- 6%	- 7%	- 3%	3%	3,50

d = mean of differences　　　Sd = standard deviation of differences　　　t = Student test - comparison to 0

Upper limits :　　$\overline{d}$ = +/- 10%　　Sd = 10%

ISO 13366-2|IDF 148-2 : Precision of the method :

Level SCC *10³ /ml	Sr %	r	SR %	R
150	6	25	9	38
200	5	42	8	67
450	4	50	7	88
750	3	63	6	126
1500	3	126	6	252

Table V :   **ACCURACY - differences (laboratory - reference) in %**

Sample Lab code	31	32	33	34	35	36	37	38	39	40	d	Sd$_{lab}$	t
31	- 2%	- 2%	+ 6%	+ 1%	+ 5%	- 1%	- 1%	+ 3%	+ 7%	+ 1%	- 0%	2%	0,41
32	+ 1%	+ 1%	- 1%	- 2%	+ 1%	+ 2%	- 0%	+ 1%	- 2%	+ 2%	+ 1%	2%	1,62
33	+ 7%	+ 4%	+ 1%	+ 4%	+ 3%	+ 4%	+ 4%	+ 7%	- 4%	+ 3%	+ 5%	4%	3,33
34	+ 6%	+ 6%	+ 7%	+ 9%	+ 7%	+ 7%	+ 6%	+ 6%	+ 4%	+ 3%	+ 6%	5%	3,92
35	+ 0%	- 2%	- 5%	- 4%	- 9%	- 5%	- 6%	- 5%	- 17%	- 9%	- 4%	4%	3,41
36	+ 0%	+ 2%	+ 0%	+ 0%	+ 1%	- 0%	+ 1%	- 1%	- 1%	- 2%	+ 0%	1%	1,18
37	- 7%	- 13%	- 16%	- 10%	- 13%	- 13%	- 11%	- 12%	- 18%	- 18%	- 11%	10%	3,77
38	- 10%	- 14%	- 13%	- 3%	- 9%	- 9%	- 7%	+ 0%	+ 2%	+ 2%	- 9%	10%	2,68
39	+ 2%	- 4%	- 3%	- 11%	- 9%	- 10%	- 11%	- 10%	- 4%	- 1%	- 6%	8%	2,48
40	- 4%	- 6%	- 6%	+ 1%	- 3%	- 6%	- 2%	- 4%	+ 2%	+ 3%	- 4%	5%	2,47
41	- 3%	- 8%	- 11%	- 7%	- 4%	- 9%	- 6%	- 8%	+ 4%	- 10%	- 7%	7%	3,22
42	+ 3%	+ 4%	+ 3%	+ 3%	+ 3%	+ 3%	+ 2%	+ 4%	- 1%	- 1%	+ 3%	3%	3,26
43	- 1%	- 2%	+ 3%	- 1%	+ 4%	- 2%	+ 1%	- 2%	+ 15%	+ 5%	- 1%	2%	1,01
44	+ 10%	+ 9%	+ 18%	+ 8%	+ 8%	+ 7%	+ 11%	+ 23%	+ 6%	+ 10%	+ 10%	7%	4,55
45	+ 9%	+ 10%	+ 13%	+ 9%	+ 9%	+ 9%	+ 14%	+ 12%	+ 3%	+ 5%	+ 10%	8%	4,01
46	- 10%	- 10%	- 11%	- 10%	- 11%	- 9%	- 11%	- 12%	- 10%	- 13%	- 10%	8%	4,13
47	- 9%	- 10%	- 10%	- 11%	- 10%	- 9%	- 8%	- 12%	- 9%	- 12%	- 10%	8%	4,01
48	- 7%	- 1%	- 23%	- 13%	- 1%	- 20%	- 3%	- 23%	- 22%	+ 20%	- 10%	15%	2,24
49	+ 10%	+ 9%	+ 5%	+ 10%	+ 4%	+ 10%	+ 8%	+ 11%	+ 4%	+ 4%	+ 9%	8%	3,44
50	- 3%	+ 3%	- 1%	+ 2%	+ 2%	+ 7%	- 1%	+ 2%	- 8%	- 4%	+ 2%	6%	0,94
51	- 6%	- 8%	- 6%	- 9%	- 4%	- 7%	- 8%	- 9%	- 2%	- 13%	- 7%	6%	3,80
52	+ 9%	+ 6%	+ 1%	+ 4%	+ 5%	+ 4%	+ 3%	+ 3%	- 1%	- 37%	+ 4%	6%	2,16
53	+ 11%	+ 10%	+ 8%	+ 7%	+ 3%	+ 3%	+ 8%	+ 7%	+ 14%	- 0%	+ 7%	7%	3,27
54	- 1%	+ 19%	+ 21%	+ 21%	+ 22%	- 1%	+ 18%	+ 19%	+ 25%	+ 20%	+ 11%	13%	2,71
55	- 8%	- 7%	- 4%	- 3%	- 6%	- 8%	- 6%	- 10%	+ 13%	+ 6%	- 7%	7%	3,01
56	- 0%	+ 1%	+ 1%	- 1%	- 0%	+ 1%	+ 1%	+ 1%	+ 10%	+ 7%	+ 1%	1%	2,73
57	+ 7%	+ 1%	+ 6%	+ 7%	+ 5%	+ 7%	+ 6%	+ 7%	- 0%	+ 10%	+ 6%	5%	3,35
58	+ 2%	+ 2%	+ 1%	+ 1%	+ 4%	+ 2%	+ 2%	+ 3%	- 1%	+ 0%	+ 2%	2%	3,65
59	+ 1%	- 6%	- 1%	- 7%	+ 6%	+ 3%	- 1%	+ 4%	+ 6%	+ 2%	- 0%	5%	0,12
60	- 0%	- 8%	- 5%	- 8%	- 3%	+ 3%	- 4%	- 1%	- 0%	+ 1%	- 2%	6%	1,33
61	- 1%	- 6%	- 5%	- 4%	- 11%	- 8%	- 9%	- 6%	- 9%	- 7%	- 6%	6%	3,09
62	+ 3%	+ 1%	+ 7%	+ 6%	+ 5%	+ 5%	+ 4%	+ 5%	+ 6%	+ 7%	+ 4%	3%	3,85
63	- 2%	- 1%	- 5%	+ 1%	- 3%	- 3%	- 3%	- 3%	+ 2%	+ 5%	- 2%	3%	2,81
64	+ 5%	+ 2%	+ 2%	+ 1%	+ 0%	+ 4%	+ 3%	+ 0%	- 2%	+ 2%	+ 3%	3%	2,57
65	- 0%	+ 1%	- 1%	- 3%	+ 0%	+ 6%	+ 2%	- 0%	+ 9%	+ 0%	+ 2%	5%	1,15
66	+ 1%	+ 3%	+ 2%	+ 2%	+ 5%	+ 3%	+ 4%	+ 5%	+ 15%	+ 10%	+ 3%	2%	4,07
67	+ 0%	+ 1%	- 7%	+ 2%	+ 2%	+ 2%	- 2%	- 1%	- 14%	+ 1%	+ 0%	2%	0,24
68	- 5%	- 3%	- 2%	- 4%	+ 1%	- 0%	- 3%	- 2%	- 13%	- 2%	- 3%	3%	2,87
69	+ 2%	+ 0%	- 6%	+ 0%	+ 4%	- 0%	+ 3%	+ 5%	+ 12%	+ 3%	+ 1%	2%	1,69
d	+ 0%	+ 0%	+ 0%	- 0%	- 0%	- 0%	+ 0%	- 0%	- 0%	- 0%	- 1%	12%	
Sd	5%	6%	7%	6%	6%	7%	6%	7%	10%	7%			

d = mean of differences   Sd = standard deviation of differences   t = Student test - comparison to 0

Upper limits : $\overline{d}$ = +/- 10%   Sd = 10%

ISO 13366-2│IDF 148-2 :   Precision of the method :

Level SCC *10^{3} /ml	Sr %	r	SR %	R
150	6	25	9	38
200	5	42	8	67
450	4	50	7	88
750	3	63	6	126
1500	3	126	6	252

Table VI : **Zscore of the different laboratories for each sample.**
ZS calculated on the PT standard deviation

Sample Lab Code	31	32	33	34	35	36	37	38	39	40
1	-15,18	-12,91	-11,39	-12,86	-13,83	-11,56	-12,95	-10,34	-6,16	-10,95
2	+0,47	+0,95	+1,03	+0,62	+0,97	+0,70	+0,44	+0,75	-0,12	-0,13
3	+1,30	+0,26	+0,68	+0,91	+1,49	+1,23	+1,25	+0,61	-0,23	+0,25
4	+0,23	+0,12	+0,15	+0,11	-0,74	+0,13	+0,26	+0,16	-0,69	-0,82
5	+0,11	+0,75	+0,15	+0,53	+0,35	+0,47	+0,62	-0,04	+0,79	+0,25
6	-1,51	-1,04	-0,22	-1,03	-1,02	-0,93	-1,15	-0,74	-1,37	-1,58
7	-0,37	-0,21	+0,05	-0,48	-0,12	-0,03	-0,44	+0,12	+0,11	-0,44
8	-0,40	-0,38	-0,52	-0,35	-0,93	-0,22	-0,33	-0,71	-0,46	+0,17
9	+0,02	+0,25	-0,02	-0,06	-0,41	+0,14	-0,08	+0,10	-0,23	-0,51
10	-0,24	+0,18	+0,05	-0,12	+0,35	+0,11	-0,04	-0,12	+0,68	-0,21
11	+0,27	+0,49	+0,43	+0,13	+0,07	+0,44	+0,06	+0,22	+0,45	+0,17
12	-0,43	+0,19	+0,20	+0,87	-0,55	+0,22	+0,02	-0,07	-0,12	-1,05
13	-0,12	-0,24	+1,17	+1,40	+0,30	+0,67	+0,80	+1,07	+0,34	-0,06
14	-0,17	+0,28	+0,18	+0,70	+0,02	+0,30	-0,18	+0,38	-1,37	+0,17
15	+2,67	+2,23	+1,55	+2,41	+2,39	+2,02	+1,98	+1,85	+1,36	+1,09
16	+3,13	+2,52	+2,02	+2,32	+1,96	+2,24	+2,63	+1,38	+1,48	+1,24
17	-0,61	-0,71	-0,52	-4,06	-1,88	-3,22	-4,26	-2,81	-2,51	-2,34
18	-0,73	+0,39	-0,32	-0,29	+0,78	-0,09	-0,08	-0,28	-0,12	-0,74
19	-0,15	-1,00	-0,44	-0,84	+0,35	-0,96	-0,92	-1,05	+0,34	+0,40
20	-0,37	-0,16	+0,43	-0,01	-0,65	-0,21	+0,25	-0,13	+0,11	+0,17
21	-0,10	-0,22	+0,53	-0,37	-0,36	+0,03	-0,03	+0,00	+0,45	-0,97
22	+0,78	+0,83	+0,68	+0,41	+1,11	+0,72	+0,54	+0,36	+0,11	+1,01
23	+0,08	+0,26	+0,23	+0,34	+0,35	+0,07	+0,43	-0,16	-0,58	+0,10
24	-0,19	-0,31	-0,24	-1,40	-0,84	-1,22	-1,75	-0,58	-1,03	-0,21
25	+0,20	+0,18	-0,17	+0,34	-0,69	+0,20	-0,08	-0,23	-0,46	+0,71
26	-0,24	+0,07	-0,14	-0,46	-0,50	-0,00	+0,01	-0,08	-0,46	-1,05
27	-0,47	-0,26	-0,57	-0,35	-0,65	-0,42	-0,43	-0,55	+0,34	-0,51
28	-0,27	-0,17	-0,02	+0,17	-0,41	-0,06	-0,20	-0,26	-0,92	-0,21
29	+0,27	+0,32	-0,29	+0,32	+0,07	+0,34	-0,08	+0,11	+0,68	+0,40
30	-0,59	-0,57	-0,62	-0,20	-0,41	-0,50	-0,19	-0,71	-0,58	-0,97

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 2 :
Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation
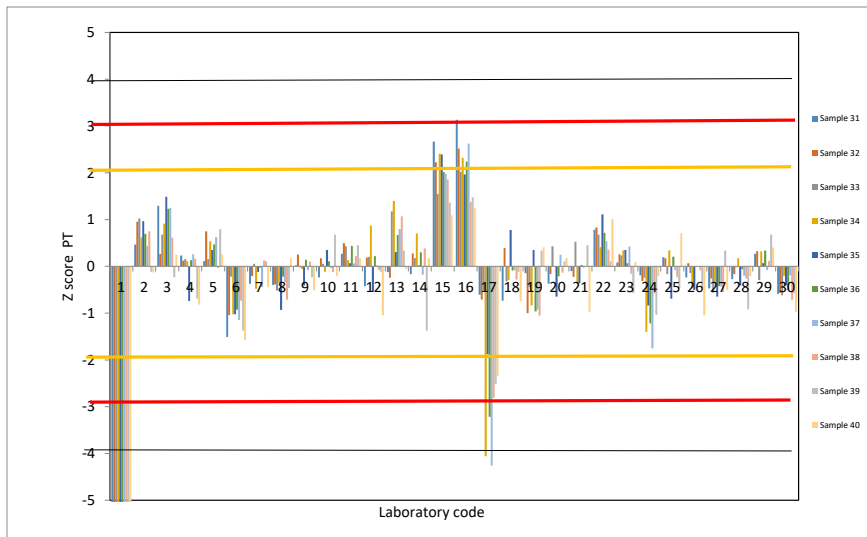
Table VI : **Zscore of the different laboratories for each sample.**
ZS calculated on the PT standard deviation

Sample Lab Code	31	32	33	34	35	36	37	38	39	40
31	-0,35	-0,29	+0,78	+0,09	+0,82	-0,19	-0,16	+0,44	+0,68	+0,10
32	+0,21	+0,18	-0,17	-0,29	+0,26	+0,32	-0,00	+0,16	-0,23	+0,33
33	+1,30	+0,63	+0,18	+0,64	+0,59	+0,60	+0,72	+0,97	-0,46	+0,40
34	+1,15	+0,92	+0,98	+1,50	+1,20	+1,02	+1,06	+0,88	+0,45	+0,48
35	+0,02	-0,37	-0,74	-0,75	-1,64	-0,79	-1,00	-0,74	-1,72	-1,20
36	+0,05	+0,28	+0,05	+0,05	+0,16	-0,02	+0,15	-0,10	-0,12	-0,28
37	-1,31	-2,09	-2,21	-1,70	-2,31	-1,88	-1,82	-1,59	-1,83	-2,57
38	-1,95	-2,30	-1,89	-0,54	-1,69	-1,31	-1,20	+0,06	+0,22	+0,25
39	+0,32	-0,59	-0,47	-1,87	-1,55	-1,55	-1,85	-1,32	-0,46	-0,21
40	-0,69	-0,92	-0,89	+0,17	-0,60	-0,97	-0,38	-0,51	+0,22	+0,40
41	-0,64	-1,30	-1,49	-1,19	-0,79	-1,38	-1,03	-1,05	+0,45	-1,35
42	+0,56	+0,70	+0,48	+0,53	+0,49	+0,47	+0,32	+0,52	-0,12	-0,13
43	-0,21	-0,25	+0,35	-0,16	+0,73	-0,25	+0,13	-0,31	+1,59	+0,71
44	+1,85	+1,46	+2,54	+1,33	+1,39	+1,03	+1,80	+1,95	+2,39	+0,86
45	+1,69	+1,67	+1,77	+1,63	+1,68	+1,32	+2,22	+1,65	+0,34	+0,63
46	-1,88	-1,72	-1,54	-1,74	-2,02	-1,39	-1,83	-1,59	-1,03	-1,88
47	-1,63	-1,69	-1,36	-1,91	-1,83	-1,39	-1,36	-1,64	-0,92	-1,73
48	-1,33	-0,09	-3,18	-2,35	-0,27	-2,95	-0,53	-3,17	-2,29	+2,84
49	+1,83	+1,49	+0,70	+1,71	+0,78	+1,45	+1,32	+1,45	+0,45	+0,55
50	-0,62	+0,42	-0,12	+0,32	+0,30	+1,07	-0,15	+0,33	-0,80	-0,59
51	-1,06	-1,38	-0,87	-1,57	-0,65	-1,08	-1,28	-1,20	-0,23	-1,81
52	+1,63	+0,91	+0,08	+0,74	+0,82	+0,67	+0,49	+0,44	-0,12	-5,16
53	+2,12	+1,59	+1,15	+1,21	+0,54	+0,51	+1,32	+0,91	+1,48	-0,06
54	-0,25	+3,19	+2,94	+3,75	+3,86	-0,16	+2,94	+2,68	+2,62	+2,76
55	-1,54	-1,18	-0,62	-0,58	-1,02	-1,20	-0,92	-1,39	+1,36	+0,86
56	-0,02	+0,18	+0,13	-0,10	-0,03	+0,08	+0,19	+0,07	+1,02	+0,94
57	+1,22	+0,23	+0,90	+1,27	+0,82	+1,06	+0,94	+0,90	-0,01	+1,39
58	+0,31	+0,35	+0,20	+0,20	+0,68	+0,30	+0,36	+0,44	-0,12	+0,02
59	+0,18	-0,96	-0,09	-1,19	+1,06	+0,50	-0,20	+0,60	+0,56	+0,25
60	-0,06	-1,32	-0,67	-1,38	-0,50	+0,40	-0,62	-0,15	-0,01	+0,17
61	-0,25	-1,01	-0,67	-0,63	-1,93	-1,20	-1,43	-0,81	-0,92	-1,05
62	+0,47	+0,16	+0,93	+1,06	+0,92	+0,70	+0,58	+0,70	+0,56	+1,01
63	-0,45	-0,22	-0,67	+0,09	-0,50	-0,49	-0,45	-0,43	+0,22	+0,63
64	+0,91	+0,33	+0,30	+0,24	+0,07	+0,56	+0,52	+0,06	-0,23	+0,25
65	-0,00	+0,10	-0,14	-0,46	+0,07	+0,94	+0,38	-0,01	+0,91	+0,02
66	+0,18	+0,55	+0,25	+0,30	+0,82	+0,41	+0,61	+0,64	+1,59	+1,39
67	+0,04	+0,18	-0,94	+0,34	+0,45	+0,26	-0,30	-0,12	-1,49	+0,10
68	-1,00	-0,52	-0,32	-0,79	+0,16	-0,07	-0,42	-0,27	-1,37	-0,28
69	+0,44	+0,04	-0,79	+0,05	+0,68	-0,05	+0,47	+0,65	+1,25	+0,48

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 2 :

Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation
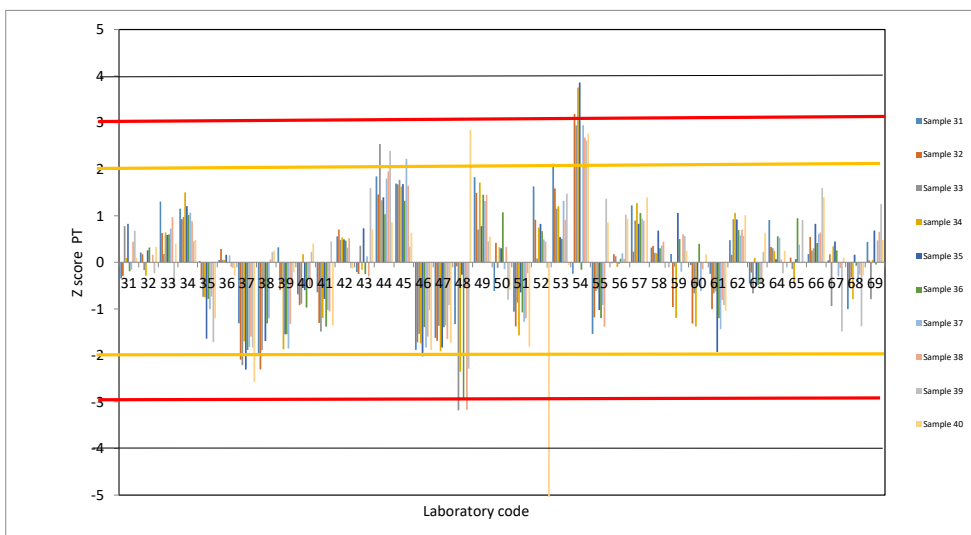
Table VII :   **Zscore of the different laboratories for each sample.**
ZS calculated on AVT and standard deviation of reproducibility of the method

Sample / Lab code	31	32	33	34	35	36	37	38	39	40
1	-13,43	-12,98	-9,84	-10,01	-8,68	-12,74	-12,98	-11,15	-6,19	-8,62
2	+0,98	+1,34	+1,30	+0,66	+1,14	+1,13	+0,69	+1,18	+1,38	+0,60
3	+1,74	+0,63	+0,99	+0,89	+1,48	+1,73	+1,52	+1,03	+1,24	+0,93
4	+0,76	+0,48	+0,52	+0,26	+0,00	+0,49	+0,51	+0,53	+0,67	+0,02
5	+0,65	+1,13	+0,52	+0,59	+0,73	+0,87	+0,88	+0,31	+2,52	+0,93
6	-0,84	-0,72	+0,18	-0,64	-0,19	-0,71	-0,93	-0,47	-0,19	-0,63
7	+0,20	+0,14	+0,43	-0,21	+0,41	+0,31	-0,21	+0,49	+1,67	+0,35
8	+0,18	-0,04	-0,08	-0,11	-0,12	+0,09	-0,10	-0,44	+0,95	+0,86
9	+0,57	+0,62	+0,36	+0,12	+0,22	+0,50	+0,16	+0,46	+1,24	+0,28
10	+0,33	+0,54	+0,43	+0,07	+0,73	+0,46	+0,21	+0,21	+2,38	+0,54
11	+0,79	+0,87	+0,76	+0,27	+0,54	+0,83	+0,31	+0,60	+2,10	+0,86
12	+0,15	+0,55	+0,56	+0,86	+0,13	+0,59	+0,26	+0,27	+1,38	-0,17
13	+0,44	+0,11	+1,43	+1,27	+0,69	+1,10	+1,06	+1,54	+1,95	+0,67
14	+0,40	+0,64	+0,54	+0,72	+0,51	+0,68	+0,06	+0,77	-0,19	+0,86
15	+3,00	+2,66	+1,77	+2,07	+2,08	+2,62	+2,26	+2,41	+3,24	+1,64
16	+3,44	+2,96	+2,19	+2,01	+1,80	+2,87	+2,93	+1,88	+3,38	+1,77
17	-0,01	-0,37	-0,08	-3,04	-0,75	-3,30	-4,11	-2,78	-1,62	-1,28
18	-0,13	+0,76	+0,09	-0,06	+1,01	+0,24	+0,16	+0,04	+1,38	+0,09
19	+0,41	-0,67	-0,02	-0,49	+0,73	-0,75	-0,69	-0,82	+1,95	+1,06
20	+0,20	+0,19	+0,76	+0,16	+0,07	+0,10	+0,50	+0,20	+1,67	+0,86
21	+0,45	+0,13	+0,85	-0,13	+0,25	+0,37	+0,22	+0,35	+2,10	-0,11
22	+1,27	+1,22	+0,99	+0,49	+1,23	+1,15	+0,79	+0,75	+1,67	+1,58
23	+0,62	+0,62	+0,59	+0,44	+0,73	+0,41	+0,68	+0,17	+0,81	+0,80
24	+0,37	+0,04	+0,16	-0,94	-0,06	-1,04	-1,55	-0,29	+0,24	+0,54
25	+0,73	+0,54	+0,23	+0,44	+0,03	+0,57	+0,16	+0,09	+0,95	+1,32
26	+0,33	+0,43	+0,25	-0,19	+0,16	+0,34	+0,25	+0,26	+0,95	-0,17
27	+0,11	+0,09	-0,13	-0,11	+0,07	-0,14	-0,20	-0,26	+1,95	+0,28
28	+0,30	+0,18	+0,36	+0,31	+0,22	+0,27	+0,04	+0,06	+0,38	+0,54
29	+0,79	+0,69	+0,12	+0,42	+0,54	+0,72	+0,16	+0,47	+2,38	+1,06
30	+0,00	-0,23	-0,17	+0,01	+0,22	-0,23	+0,05	-0,44	+0,81	-0,11

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation
has always the value of SR of the method SR : Cf page 7 and 8 /13

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method
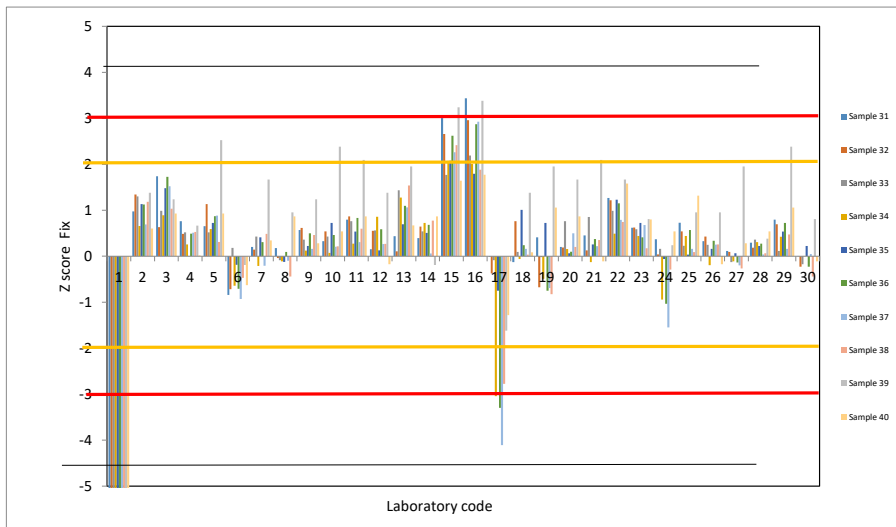
Table VII :   **Zscore of the different laboratories for each sample.**
                               ZS calculated on AVT and standard deviation of reproducibility of the method
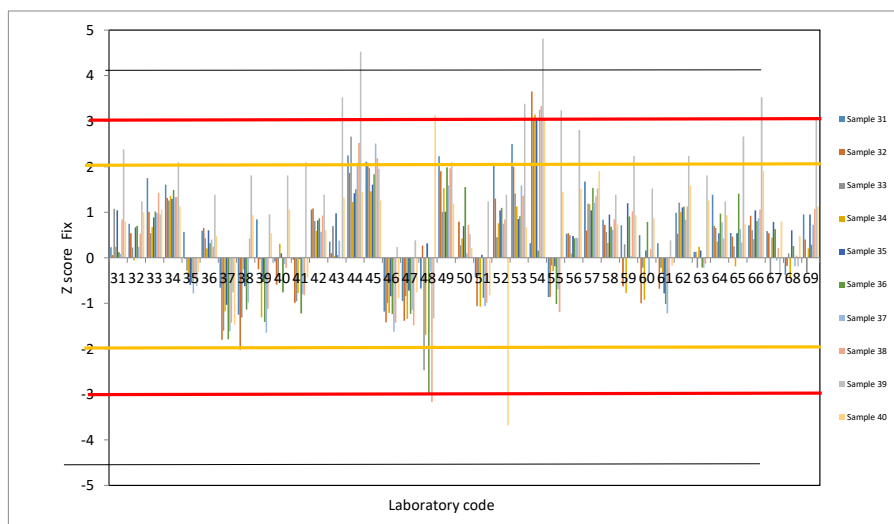
Sample \ Lab code	31	32	33	34	35	36	37	38	39	40
31	+0,23	+0,06	+1,08	+0,24	+1,04	+0,12	+0,08	+0,84	+2,38	+0,80
32	+0,74	+0,54	+0,23	-0,06	+0,66	+0,70	+0,24	+0,53	+1,24	+0,99
33	+1,75	+1,01	+0,54	+0,67	+0,88	+1,01	+0,98	+1,43	+0,95	+1,06
34	+1,61	+1,31	+1,25	+1,36	+1,29	+1,49	+1,33	+1,33	+2,10	+1,12
35	+0,57	-0,02	-0,29	-0,43	-0,59	-0,55	-0,78	-0,47	-0,62	-0,30
36	+0,59	+0,65	+0,43	+0,21	+0,60	+0,32	+0,40	+0,24	+1,38	+0,47
37	-0,66	-1,80	-1,60	-1,18	-1,03	-1,79	-1,61	-1,42	-0,76	-1,47
38	-1,25	-2,02	-1,31	-0,26	-0,63	-1,14	-0,98	+0,42	+1,81	+0,93
39	+0,84	-0,25	-0,04	-1,31	-0,53	-1,41	-1,65	-1,12	+0,95	+0,54
40	-0,09	-0,59	-0,42	+0,31	+0,10	-0,76	-0,14	-0,22	+1,81	+1,06
41	-0,05	-0,99	-0,96	-0,78	-0,03	-1,22	-0,80	-0,82	+2,10	-0,43
42	+1,06	+1,08	+0,81	+0,59	+0,82	+0,87	+0,57	+0,92	+1,38	+0,60
43	+0,35	+0,10	+0,70	+0,04	+0,98	+0,06	+0,38	+0,01	+3,52	+1,32
44	+2,25	+1,87	+2,66	+1,22	+1,42	+1,51	+2,08	+2,08	+4,52	+1,45
45	+2,11	+2,09	+1,97	+1,46	+1,61	+1,83	+2,51	+2,18	+1,95	+1,25
46	-1,18	-1,42	-1,00	-1,21	-0,85	-1,23	-1,62	-1,42	+0,24	-0,89
47	-0,95	-1,38	-0,84	-1,34	-0,72	-1,23	-1,14	-1,48	+0,38	-0,76
48	-0,68	+0,27	-2,47	-1,69	+0,32	-3,00	-0,30	-3,17	-1,33	+3,14
49	+2,23	+1,90	+1,01	+1,52	+1,01	+1,98	+1,59	+1,96	+2,10	+1,19
50	-0,02	+0,79	+0,27	+0,42	+0,69	+1,55	+0,09	+0,72	+0,52	+0,22
51	-0,43	-1,06	-0,40	-1,08	+0,07	-0,88	-1,06	-0,99	+1,24	-0,82
52	+2,05	+1,30	+0,45	+0,76	+1,04	+1,10	+0,75	+0,84	+1,38	-3,68
53	+2,50	+2,00	+1,41	+1,12	+0,85	+0,92	+1,59	+1,36	+3,38	+0,67
54	+0,32	+3,65	+3,02	+3,14	+3,05	+0,16	+3,25	+3,33	+4,81	+3,07
55	-0,87	-0,86	-0,17	-0,29	-0,19	-1,02	-0,69	-1,19	+3,24	+1,45
56	+0,53	+0,54	+0,50	+0,09	+0,47	+0,42	+0,44	+0,43	+2,81	+1,51
57	+1,67	+0,60	+1,19	+1,17	+1,04	+1,53	+1,21	+1,35	+1,52	+1,90
58	+0,84	+0,72	+0,56	+0,32	+0,95	+0,68	+0,61	+0,84	+1,38	+0,73
59	+0,71	-0,63	+0,29	-0,78	+1,20	+0,90	+0,04	+1,02	+2,24	+0,93
60	+0,49	-1,00	-0,22	-0,93	+0,16	+0,79	-0,39	+0,19	+1,52	+0,86
61	+0,32	-0,68	-0,22	-0,33	-0,78	-1,02	-1,22	-0,55	+0,38	-0,17
62	+0,98	+0,53	+1,21	+1,01	+1,10	+1,13	+0,84	+1,13	+2,24	+1,58
63	+0,13	+0,13	-0,22	+0,24	+0,16	-0,21	-0,22	-0,13	+1,81	+1,25
64	+1,38	+0,70	+0,65	+0,36	+0,54	+0,97	+0,78	+0,42	+1,24	+0,93
65	+0,54	+0,46	+0,25	-0,19	+0,54	+1,41	+0,63	+0,34	+2,67	+0,73
66	+0,71	+0,92	+0,61	+0,41	+1,04	+0,80	+0,87	+1,06	+3,52	+1,90
67	+0,59	+0,54	-0,46	+0,44	+0,79	+0,63	-0,06	+0,21	-0,33	+0,80
68	-0,38	-0,18	+0,09	-0,46	+0,60	+0,26	-0,19	+0,05	-0,19	+0,47
69	+0,95	+0,40	-0,33	+0,21	+0,95	+0,28	+0,72	+1,08	+3,10	+1,12

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation
has always the value of SR of the method SR : Cf page 7 and 8 /13

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method

ICAR Interlaboratory Proficiency Study - March 2023

Trial of : 06/03/2023

10 Labs OUT OF THE TARGET (15 %)

Sd

42%

69 laboratories
10 samples

1
15
16
17
37
38
45
46
48
54

28%

Student 5 %   Student 5 %

14%

0%

d̄

-30%   -20%   -10%   0%   10%   20%   30%

Target limits : d̄ = +/- 10 %
              Sd =   10 %

Figure 1 :   **ACCURACY - Evaluation of the individual performances (to see table I).**

ICAR

PROFICIENCY TESTING SCHEME

March 2023

Raw Milk

Enumeration of SOMATIC CELLS

Sending date of statistical treatment :   24th March 2023

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)
ICAR Staff	Silvia Orlandini pt@icar.org silvia@icar.org

Proficiency test accreditated ISO 17043

Table I : Ranking of the laboratories in %

Nb	%	N°	d	Sd	D	Method
1	2	10	+ 0%	0%	0%	B
2	4	19	+ 1%	1%	1%	B
3	5	62	+ 1%	0%	1%	B
4	7	20	- 1%	1%	1%	B
5	9	9	- 1%	0%	1%	B
6	11	40	- 2%	1%	2%	B
7	13	67	+ 1%	2%	2%	B
8	15	18	- 0%	2%	2%	B
9	16	43	+ 2%	1%	2%	B
10	18	13	+ 1%	2%	2%	B
11	20	22	+ 2%	1%	2%	B
12	22	56	+ 0%	2%	2%	B
13	24	48	+ 1%	2%	2%	B
14	25	59	+ 1%	2%	3%	B
15	27	11	+ 0%	3%	3%	B
16	29	24	+ 1%	3%	3%	B
17	31	21	- 2%	2%	3%	B
18	33	36	- 3%	2%	3%	B
19	35	12	- 3%	2%	4%	B
20	36	66	- 0%	4%	4%	B
21	38	42	+ 2%	3%	4%	B
22	40	14	+ 4%	1%	4%	B
23	42	58	+ 5%	0%	5%	B
24	44	4	- 4%	3%	5%	B
25	45	68	- 0%	6%	6%	B
26	47	69	- 6%	1%	6%	B
27	49	31	- 3%	6%	6%	B
28	51	39	- 4%	5%	7%	B
29	53	38	- 7%	5%	8%	B
30	55	41	- 7%	5%	9%	B

Nb	%	N°	d	Sd	D	Method
31	56	37	- 7%	5%	9%	B
32	58	32	- 3%	8%	9%	B
33	60	57	+ 6%	6%	9%	B
34	62	49	+ 8%	4%	9%	B
35	64	35	+ 7%	7%	10%	B
36	65	3	+ 8%	7%	11%	B
37	67	63	- 8%	8%	11%	B
38	69	33	+ 5%	10%	11%	B
39	71	2	+ 7%	9%	12%	B
40	73	6	- 10%	7%	12%	B
41	75	55	- 7%	11%	13%	B
42	76	23	- 8%	11%	14%	B
43	78	50	- 10%	11%	15%	B
44	80	16	+ 14%	14%	20%	B
45	82	15	+ 14%	14%	20%	B
46	84	44	+ 13%	15%	20%	A
47	85	46	- 15%	14%	21%	B
48	87	54	+ 13%	17%	21%	B
49	89	47	- 16%	15%	21%	B
50	91	51	- 16%	16%	23%	B
51	93	64	+ 20%	15%	25%	B
52	95	61	+ 26%	5%	27%	B
53	96	65	+ 20%	22%	30%	B
54	98	17	- 19%	23%	30%	A
55	100	1	- 74%	69%	101%	A
N.C.		5				B
N.C.		7				B
N.C.		8				B
N.C.		25				B
N.C.		26				B
N.C.		27				B
N.C.		28				B
N.C.		29				B
N.C.		30				B
N.C.		34				B
N.C.		45				B
N.C.		52				B
N.C.		53				B
N.C.		60				B

(NC : OUT of RANKING because of insufficient data number)

(Nb : laboratory rank;   % : relative rank)

(N° : laboratory identification number)

(d et Sd : mean and standard deviation of the differences (laboratory -reference))

(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d² + Sd²))

The table should be studied in parallel with figure 1 where the laboratories are located according to an acceptability area (or target) the limits of which are :

$\overline{}$
+/- 10% for d and 10% for Sd

A   ISO 13366-1 │ IDF 148-1

B   ISO 13366-2 │ IDF 148-2

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 54 laboratories using reference metod ISO 13366-1│IDF 148-1 and alternative method ISO 13366-2│IDF 148-2 after outlier discarding using Grubbs test at 5% risk level

Note :   Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation.

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %)	Sr_{PT}	11	2%
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	57	11%

Table II :　　**REPEATABILITY - Absolute difference between replicates in 10^3 cells / ml**

Sample Lab code	A	B	Sr	NL
1	5	4	3	4
2	4	8	4	4
3	5	1	3	4
4	5	16	8	4
5	**	**		
6	6	4	4	4
7	**	**		
8	**	**		
9	3	15	8	4
10	10	6	6	4
11	3	5	3	4
12	8	53	27	4
13	4	18	9	4
14	4	4	3	4
15	2	16	8	4
16	3	25	13	4
17	2	22	11	4
18	30	15	17	4
19	5	11	6	4
20	24	43	25	4
21	12	5	7	4
22	28	70 *	38	4
23	6	10	6	4
24	6	1	3	4
25	**	**		
26	**	**		
27	**	**		
28	**	**		
29	**	**		
30	**	**		

Sample Lab code	A	B	Sr	NL
31	9	35	18	4
32	8	16	9	4
33	5	39	20	4
34	**	**		
35	21	13	12	4
36	7	29	15	4
37	2	15	8	4
38	15	30	17	4
39	15	15	11	4
40	1	2	1	4
41	4	0	2	4
42	1	15	8	4
43	11	11	8	4
44	9	4	5	4
45	**	**		
46	3	2	2	4
47	3	0	2	4
48	22	94 *	48	4
49	8	17	9	4
50	5	21	11	4
51	2	26	13	4
52	**	**		
53	**	**		
54	2	9	5	4
55	26	4	13	4
56	6	29	15	4
57	1	4	2	4
58	11	15	9	4
59	2	2	1	4
60	**	**		
61	20	28	17	4
62	0	0	0	4
63	0	0	0	4
64	9	9	6	4
65	2	35	18	4
66	10	14	9	4
67	3	15	8	4
68	0	0	0	4
69	14	5	7	4
Sr	8	17		220
r	42	126		
NE	110	110		
L	34	59		

Level 10.^{3} / ml	Sr %	r
150	6	25
200	5	42
450	4	50
750	3	63
1500	3	126

Sr : repeatability standard deviation of each laboratory limit : **C**f up down

NL : number of measurements per laboratory

L : Limit for difference between duplicates according Cochran test at 5% level.

SE : repeatability standard deviation per sample

NE : number of measurements per sample

*: discarded data using the test of Cochran at 5 %

** : missing data

r : limit of repeatability, absolute difference betwen two replicates according ISO 13366-2 / IDF 148-2 : Cf up down

Table III :   **Means of the replicates in 10³ cells / ml**

Sample Lab code	A		B	
1	57	*	220	*
2	191		933	
3	200		931	
4	174		830	
5				
6	159		782	
7				
8				
9	177		855	
10	184		863	
11	175		874	
12	176		839	
13	182		873	
14	208		875	
15	202		986	
16	209		987	
17	169		675	
18	189		853	
19	191		864	
20	186		854	
21	179		842	
22	190		875	
23	183		775	
24	178		877	
25				
26				
27				
28				
29				
30				

Sample Lab code	A		B
31	188		824
32	199		815
33	178		926
34			
35	197		928
36	179		840
37	166		807
38	168		807
39	180		821
40	179		851
41	170		807
42	186		885
43	188		875
44	201		986
45			
46	157		730
47	158		726
48	179		873
49	213		919
50	177		769
51	160		717
52			
53			
54	189		989
55	190		783
56	195		855
57	196		917
58	209		887
59	182		876
60			
61	305	*	1016
62	192		866
63	173		792
64	233		1020
65	210		1050
66	170		874
67	183		872
68	205		840
69	151		832
M	185		863
REF.	185		861
SD	16		77
AVT	188		860

Table IV :

Sample	A		B
Outliers Cochran			22; 48
Outlier Grubbs	1; 61		1
sr			
SR			
sr %			
SR %			

	A		B
SR Method for AVT values	16		52

REF. = reference values

M = mean per sample

SD = standard deviation per sample

AVT = Assign value traceable to the ERM BD001

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528,

of 54 laboratories using the reference method ISO 13366│IDF 148-1 and alternative method ISO 13366-2│IDF 148-2,

after outlier discarding using Grubbs test at 5% risk level

Outlier identification   *: discarded data using the test of Grubbs 5 %

Table V :   **ACCURACY - differences (laboratory - reference) in %**

Sample Lab code	A	B	d	Sd_lab	t
1	- 69%	- 74%	- 74%	69%	1,50
2	+ 4%	+ 8%	+ 7%	9%	1,20
3	+ 8%	+ 8%	+ 8%	7%	1,55
4	- 6%	- 4%	- 4%	3%	2,09
5					
6	- 14%	- 9%	- 10%	7%	1,95
7					
8					
9	- 4%	- 1%	- 1%	0%	12,21
10	- 0%	+ 0%	+ 0%	0%	0,53
11	- 5%	+ 1%	+ 0%	3%	0,10
12	- 5%	- 3%	- 3%	2%	2,19
13	- 1%	+ 1%	+ 1%	2%	0,65
14	+ 13%	+ 2%	+ 4%	1%	3,80
15	+ 9%	+ 14%	+ 14%	14%	1,33
16	+ 13%	+ 15%	+ 14%	14%	1,47
17	- 8%	- 22%	- 19%	23%	1,18
18	+ 2%	- 1%	- 0%	2%	0,33
19	+ 3%	+ 0%	+ 1%	1%	2,16
20	+ 1%	- 1%	- 1%	1%	0,68
21	- 3%	- 2%	- 2%	2%	1,77
22	+ 3%	+ 2%	+ 2%	1%	2,33
23	- 1%	- 10%	- 8%	11%	1,04
24	- 4%	+ 2%	+ 1%	3%	0,40
25					
26					
27					
28					
29					
30					

Sample Lab code	A	B	d	Sd_lab	t
31	+ 2%	- 4%	- 3%	6%	0,85
32	+ 8%	- 5%	- 3%	8%	0,52
33	- 4%	+ 7%	+ 5%	10%	0,80
34					
35	+ 6%	+ 8%	+ 7%	7%	1,44
36	- 3%	- 3%	- 3%	2%	1,76
37	- 10%	- 6%	- 7%	5%	2,02
38	- 9%	- 6%	- 7%	5%	1,91
39	- 3%	- 5%	- 4%	5%	1,28
40	- 3%	- 1%	- 2%	1%	3,81
41	- 8%	- 6%	- 7%	5%	1,73
42	+ 1%	+ 3%	+ 2%	3%	1,09
43	+ 2%	+ 2%	+ 2%	1%	1,58
44	+ 9%	+ 14%	+ 13%	15%	1,29
45					
46	- 15%	- 15%	- 15%	14%	1,54
47	- 15%	- 16%	- 16%	15%	1,50
48	- 3%	+ 1%	+ 1%	2%	0,36
49	+ 15%	+ 7%	+ 8%	4%	2,98
50	- 4%	- 11%	- 10%	11%	1,19
51	- 13%	- 17%	- 16%	16%	1,41
52					
53					
54	+ 2%	+ 15%	+ 13%	17%	1,07
55	+ 3%	- 9%	- 7%	11%	0,87
56	+ 6%	- 1%	+ 0%	2%	0,21
57	+ 6%	+ 6%	+ 6%	6%	1,49
58	+ 13%	+ 3%	+ 5%	0%	40,47
59	- 1%	+ 2%	+ 1%	2%	0,71
60					
61	+ 65%	+ 18%	+ 26%	5%	8,04
62	+ 4%	+ 1%	+ 1%	0%	4,37
63	- 6%	- 8%	- 8%	8%	1,40
64	+ 26%	+ 18%	+ 20%	15%	1,87
65	+ 14%	+ 22%	+ 20%	22%	1,31
66	- 8%	+ 1%	- 0%	4%	0,07
67	- 1%	+ 1%	+ 1%	2%	0,67
68	+ 11%	- 2%	- 0%	6%	0,02
69	- 18%	- 3%	- 6%	1%	17,05
d	+ 0%	+ 0%	- 1%	14%	
Sd	9%	9%			

d = mean of differences   Sd = standard deviation of differences   t = Student test - comparison to 0

Upper limits :   d̄ = +/- 10%   Sd = 10%

ISO 13366-2|IDF 148-2 :   Precision of the method :

Level SCC *10³ /ml	Sr %	r	SR %	R
150	6	25	9	38
200	5	42	8	67
450	4	50	7	88
750	3	63	6	126
1500	3	126	6	252

Table VI :   **Zscore of the different laboratories for each sample.**
                      ZS calculated on the PT standard deviation

Sample Lab code	A	B
1	-7,94	-8,29
2	+0,40	+0,93
3	+0,93	+0,89
4	-0,68	-0,40
5		
6	-1,58	-1,02
7		
8		
9	-0,50	-0,09
10	-0,03	+0,02
11	-0,62	+0,16
12	-0,53	-0,29
13	-0,16	+0,15
14	+1,46	+0,18
15	+1,08	+1,61
16	+1,49	+1,62
17	-0,96	-2,41
18	+0,28	-0,11
19	+0,37	+0,03
20	+0,09	-0,10
21	-0,34	-0,26
22	+0,34	+0,18
23	-0,09	-1,12
24	-0,40	+0,20
25		
26		
27		
28		
29		
30		

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 2 :
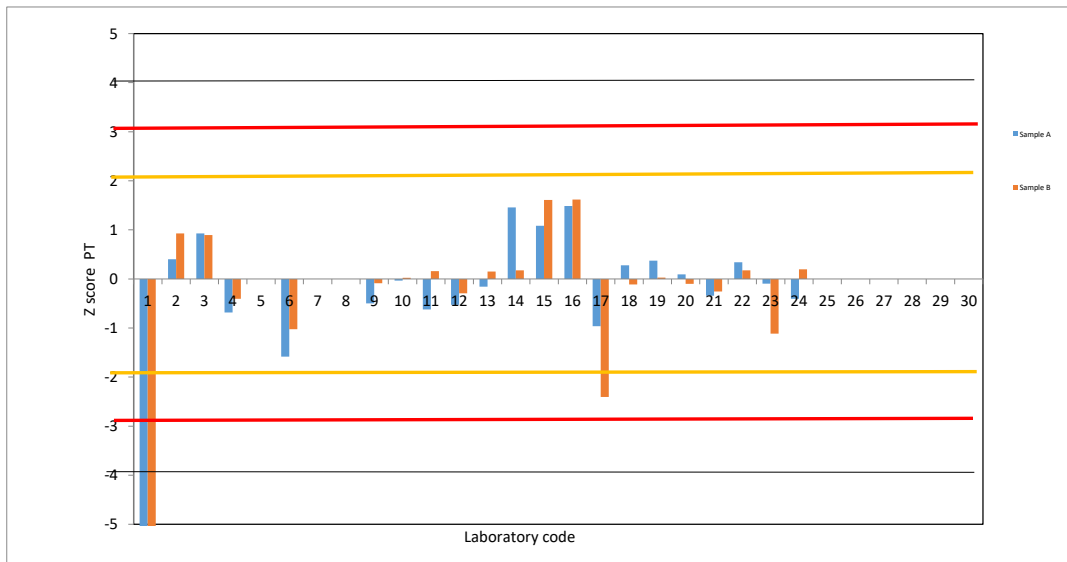Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation
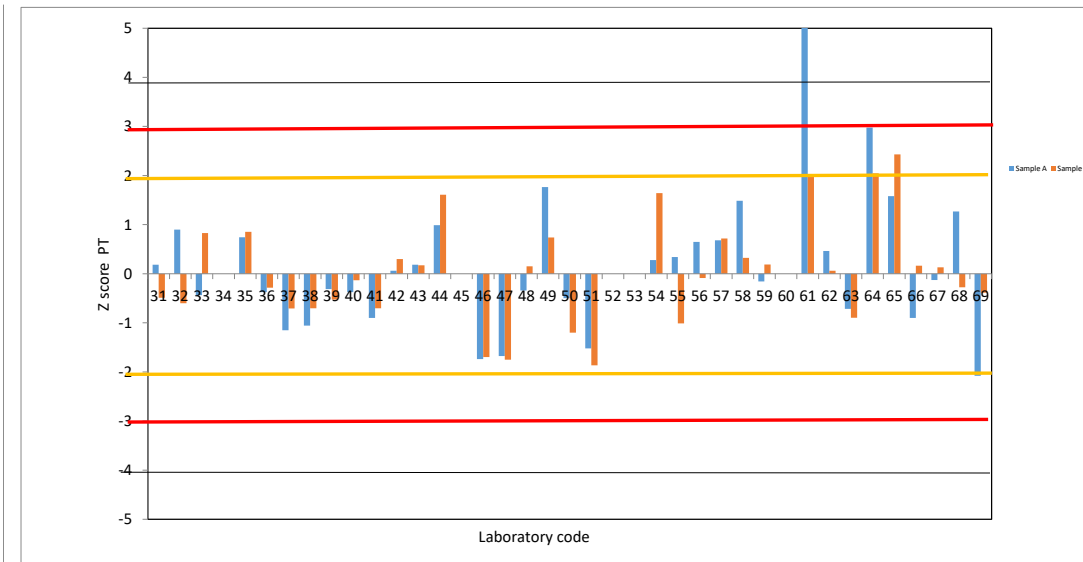
Table VI :   **Zscore of the different laboratories for each sample.**
                            ZS calculated on the PT standard deviation

Sample Lab code	A	B
31	+0,18	-0,49
32	+0,90	-0,60
33	-0,44	+0,83
34		
35	+0,74	+0,86
36	-0,37	-0,28
37	-1,15	-0,71
38	-1,06	-0,70
39	-0,31	-0,53
40	-0,37	-0,13
41	-0,90	-0,70
42	+0,06	+0,30
43	+0,18	+0,17
44	+0,99	+1,61
45		
46	-1,74	-1,70
47	-1,68	-1,75
48	-0,34	+0,15
49	+1,77	+0,74
50	-0,50	-1,20
51	-1,52	-1,86
52		
53		
54	+0,28	+1,64
55	+0,34	-1,01
56	+0,65	-0,09
57	+0,68	+0,72
58	+1,49	+0,33
59	-0,16	+0,19
60		
61	+7,47	+2,00
62	+0,46	+0,06
63	-0,71	-0,90
64	+2,98	+2,04
65	+1,58	+2,43
66	-0,90	+0,16
67	-0,13	+0,13
68	+1,27	-0,28
69	-2,08	-0,39

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 2 :

Zscore of the different laboratories for each sample. ZS calculated on the PT standard deviation

Table VII :   Zscore of the different laboratories for each sample.

ZS calculated on AVT and standard deviation of reproducibility of the method

Sample Lab code	A	B
1	-8,22	-12,30
2	+0,19	+1,41
3	+0,72	+1,36
4	-0,91	-0,57
5		
6	-1,81	-1,50
7		
8		
9	-0,72	-0,10
10	-0,25	+0,06
11	-0,84	+0,26
12	-0,75	-0,41
13	-0,38	+0,25
14	+1,25	+0,29
15	+0,88	+2,43
16	+1,28	+2,44
17	-1,19	-3,55
18	+0,06	-0,14
19	+0,16	+0,07
20	-0,13	-0,12
21	-0,56	-0,35
22	+0,13	+0,29
23	-0,31	-1,63
24	-0,63	+0,32
25		
26		
27		
28		
29		
30		

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation has always the value of SR of the method SR : Cf page 7 and 8 /13

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method
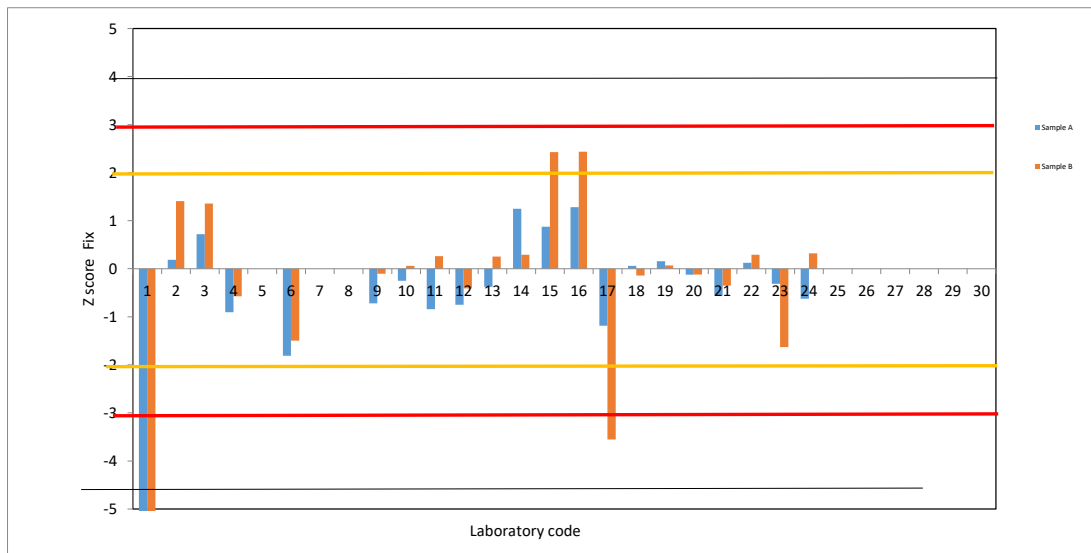
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on AVT and standard deviation
of reproducibility of the method

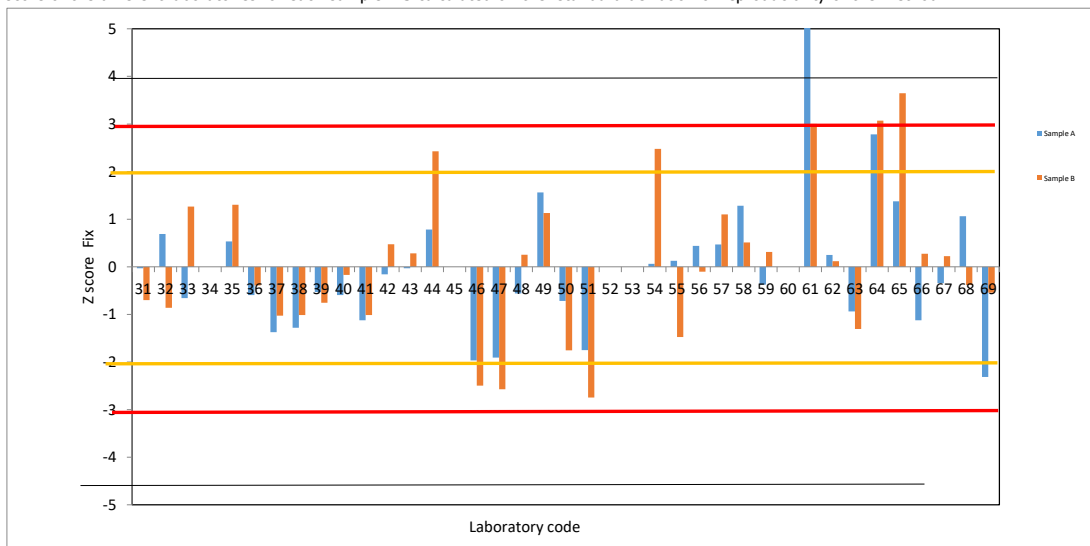| Sample Lab code	A	B
31	-0,03	-0,70
32	+0,69	-0,86
33	-0,66	+1,26
34		
35	+0,53	+1,30
36	-0,59	-0,39
37	-1,38	-1,03
38	-1,28	-1,02
39	-0,53	-0,76
40	-0,59	-0,17
41	-1,13	-1,02
42	-0,16	+0,47
43	-0,03	+0,28
44	+0,78	+2,43
45		
46	-1,97	-2,50
47	-1,91	-2,57
48	-0,56	+0,25
49	+1,56	+1,13
50	-0,72	-1,76
51	-1,75	-2,75
52		
53		
54	+0,06	+2,47
55	+0,13	-1,48
56	+0,44	-0,10
57	+0,47	+1,10
58	+1,28	+0,51
59	-0,38	+0,31
60		
61	+7,31	+3,00
62	+0,25	+0,12
63	-0,94	-1,30
64	+2,78	+3,07
65	+1,38	+3,65
66	-1,13	+0,27
67	-0,34	+0,22
68	+1,06	-0,38
69	-2,31	-0,54

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation
has always the value of SR of the method SR : Cf page 7 and 8 /13

In yellow the values bigger or smaller than 2/-2   In red the values bigger or smaller than 3/-3

Figure 3 :

Zscore of the different laboratories for each sample. ZS calculated on the standard deviation of reproducibility of the method
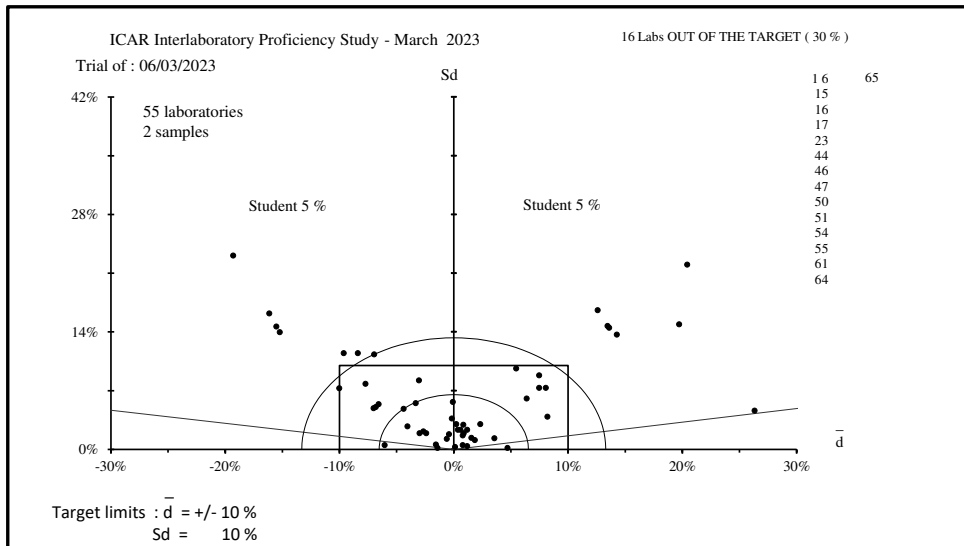
Figure 1 :   **ACCURACY - Evaluation of the individual performances (to see table I).**