THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

ICAR PROFICIENCY TEST - MARCH 2020

Raw cow milk

“Reference” Methods

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FRAME OF ACTIVITY :

ICAR MILK ANALYSES SUB-COMMITTEE (MA SC)

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1. Introduction

Dear Participant,

Thank you for participating in the ICAR Proficiency Test (PT) March 2020 !

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

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

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

Starting from this PT round, for somatic cell counting, we have introduced a stable lyophilized samples (Sample A and sample B) as a further quality assurance check of your instruments. You will receive the same in the next round. It will be useful to evaluate the stability of your instruments.

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 all 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 reference method) are summarized. 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.

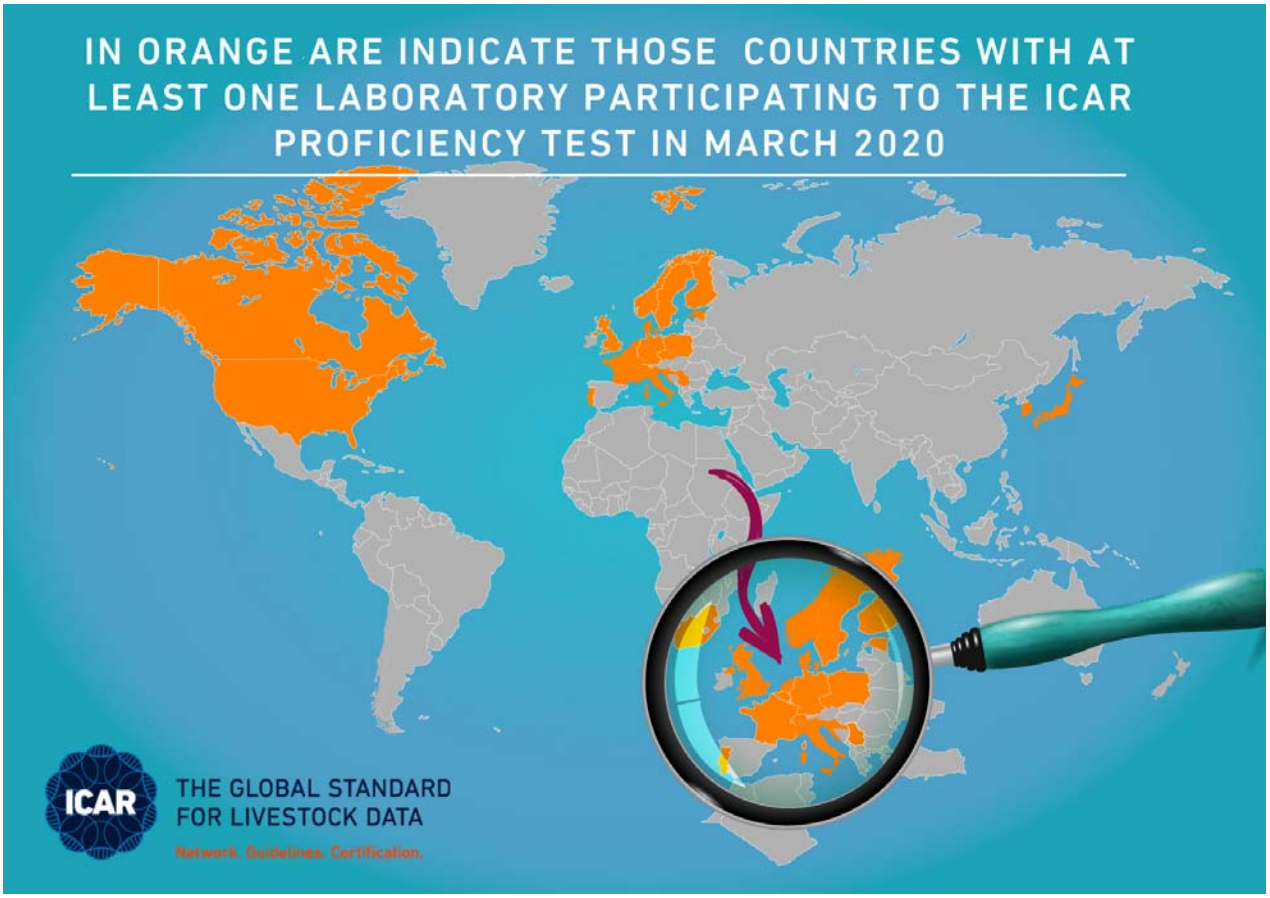
We are sure with your support and contribution it will grow to benefit all!

The list of all ICAR reference laboratories and those participated in ICAR PT 2019 with at least one parameter is reported below and upload on ICAR website (available here)

Table 1. Participating milk laboratories to the ICAR Proficiency Test (March 2020)

Country	Laboratory
Belgium	Comite du Lait ASBL
Belgium	Laboratory of milk analysis of the Valorisation of Agricultural Products, Department of Agricultural products of Walloon Agricultural Research Centre

Country	Laboratory
Canada	Central Milk Testing Lab
Canada	Horizon Lab Ltd
Canada	Lactanet Canada - Centre d'Expertise en Production Laitière du Québec
Canada	Pacific Milk Analysis
Croatia	Croatian Agency for Agriculture and Food, Central Laboratory for Milk Quality Control (Centar za kontrolu kvalitete stočarskih proizvoda)
Czech Republic	Laborator pro rozbor mléka Brno, Ceskomoravská spolecnost chovatelú a.s.
Czech Republic	MILCOM a.s Dairy Research Institute
Denmark	DNA Diagnostic
Denmark	Eurofins Milk Testing Denmark
Denmark	LVK
Estonia	Eesti Põllumajandusloomade Jõudluskontrolli AS, Milk Analysing Laboratory
Finland	Thermo Fisher Scientific
Finland	Valio Ltd, Regional laboratory
France	ACTALIA / ACTILAIT / CECALAIT
France	Labilait
Germany	Milchkontroll- und Rinderzuchtverband eG
Italy	Associazione Italiana Allevatori, Laboratorio Standard Latte (LSL-AIA)
Italy	Federazione Latterie Alto Adige Soc. Agr. Coop.
Japan	Japan Dairy Technical Association
Norway	Tine Ramelklaboratoriet Heimdal
Norway	Tine SA Mastittlaboratoriet i Molde
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	Laboratorio Regional de Veterinaria (LRV)
Serbia	Laboratorija za ispitivanje kvaliteta mleka, Poljoprivredni fakultet Novi Sad
Slovak Republic	Plemenárske služby SR, š.p., Centrálne laboratórium rozboru mlieka (Milk Laboratory, Slovak Agricultural Research Centre)
Slovenia	KGZS Zavod Ptuj
Slovenia	University of Ljubljana, Biotechnical Faculty, Zootech. Dept., Laboratory for Dairying
South Africa	Merieux NutriScciences South Africa (Midrand)
South Africa	Mérieux NutriSciences South Africa
South Korea	Korea Animal Improvement Association
Sweden	DeLaval International AB
Sweden	Eurofins Milk Testing Sweden AB
Switzerland	Agroscope Institute for food Sciences IFS
The Netherlands	Qlip B.V.
United Kingdom	CIS
USA	CentralStar Cooperative WI Lab
USA	Eastern Laboratory Services


IN ORANGE ARE INDICATE THOSE COUNTRIES WITH AT LEAST ONE LABORATORY PARTICIPATING TO THE ICAR PROFICIENCY TEST IN MARCH 2020
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Attached to this report you find the certificate of your participation in the ICAR PT.-

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

THE GLOBAL STANDARD
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Chemical Reference Methods
Laboratory participation codes and Performance analyses

ICAR PT RF0320

Laboratory Name	

A

	Your participation Codes				
Subscription	Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	$SCC_{ref/alt}$
	Yes	Yes	No	Yes	Yes
Participation Codes	1	1		1	1
Are all the sample results received?	Yes	Yes	No	Yes	Yes

B

Data results received on time	
Yes	21-03-2020

C

Have you sent the data with the correct units of measurements?					
	Fat_{ref}	$Protein^{*}_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	$SCC_{ref/alt}$
	g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
	Yes	Yes		Yes	Yes
** It was requested to report the value in total nitrogen*					

D

Ranking of your lab					
	Fat_{ref}	$Protein^{*}_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	$SCC_{ref/alt}$
	g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
Code	1	1		1	1
%	92	67		100	62%
d	0.019	-0.012		-20.897	-2%
Sd	0.012	0.016		7.469	11%
D	0.023	0.020		22.192	12%
Method	ISO 1211|IDF 1	ISO 8968-1|IDF 20-1		ISO 14637 / IDF 195	ISO 13366-1 IDF 148-1
Limits					
d	0,020	0,025	0,10	2,5	10%
Sd	0,030	0,020	0,10	1,5	10%

E

Outliers					
	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				Outlier	
Sample 2				Outlier	
Sample 3				Outlier	
Sample 4				Outlier	
Sample 5				Outlier	
Sample 6				Outlier	
Sample 7				Outlier	
Sample 8				Outlier	
Sample 9	Outlier			Outlier	
Sample 10				Outlier	

F

Repeatability					
Your "r" performance					
	Fat	Protein	Lactose	Urea	SCC
	g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
Sample 1	0.003	0.000		0.000	1
Sample 2	0.001	0.020		0.000	4
Sample 3	0.010	0.010		0.000	5
Sample 4	0.007	0.010		0.100	4
Sample 5	0.000	0.000		0.100	0.000
Sample 6	0.003	0.000		0.000	27
Sample 7	0.001	0.000		0.100	4
Sample 8	0.006	0.010		0.100	9
Sample 9	0.003	0.010		0.000	0.000
Sample 10	0.004	0.010		0.000	5

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	Protein	Lactose	Urea	SCC
g/100g	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

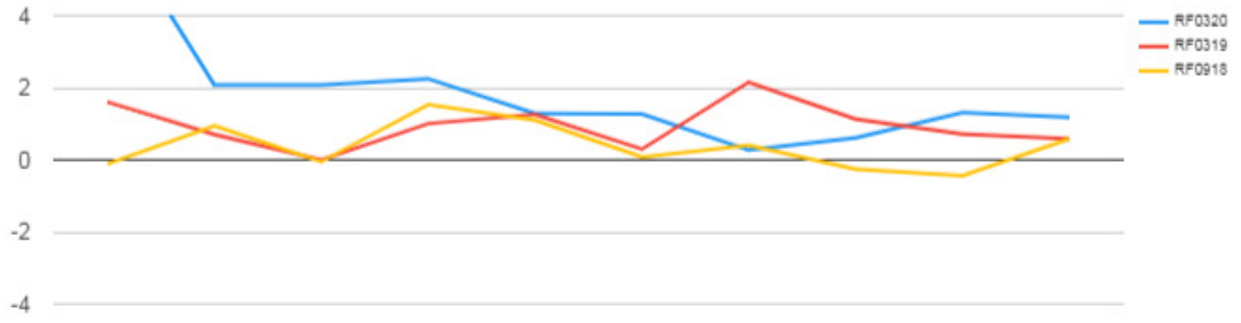
Your Z-Score PT					
	Fat	Protein	Lactose	Urea	SCC
Sample 1	1.3	-1.6		-23.7	0.30
Sample 2	1.2	-0.8		-15.2	-0.30
Sample 3	2.1	-0.7		-8.1	0.80
Sample 4	0.6	-1.8		-8.5	0.20
Sample 5	2.3	0.3		-16.5	0.60
Sample 6	2.1	0.6		-19.6	0.40
Sample 7	1.3	0.0		-8.2	-2.10
Sample 8	1.3	0.2		-7.7	0.00
Sample 9	6.8	-1.0		-8.5	-0.30
Sample 10	0.3	-0.7		-7.3	-0.80

Your Z-Score Fix					
	Fat	Protein	Lactose	Urea	SCC
Sample 1	1.2	-2.0		-15.1	0.40
Sample 2	0.7	-0.8		-17.6	-0.50
Sample 3	1.2	-0.5		-9.5	1.00
Sample 4	0.6	-2.0		-8.0	0.30
Sample 5	1.3	0.2		-10.9	0.80
Sample 6	1.1	0.4		-13.5	0.70
Sample 7	0.6	0.0		-6.7	-3.80
Sample 8	0.6	0.2		-5.5	0.00
Sample 9	2.2	-0.9		-16.2	-0.50
Sample 10	0.1	-0.6		-12.5	-1.30

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.

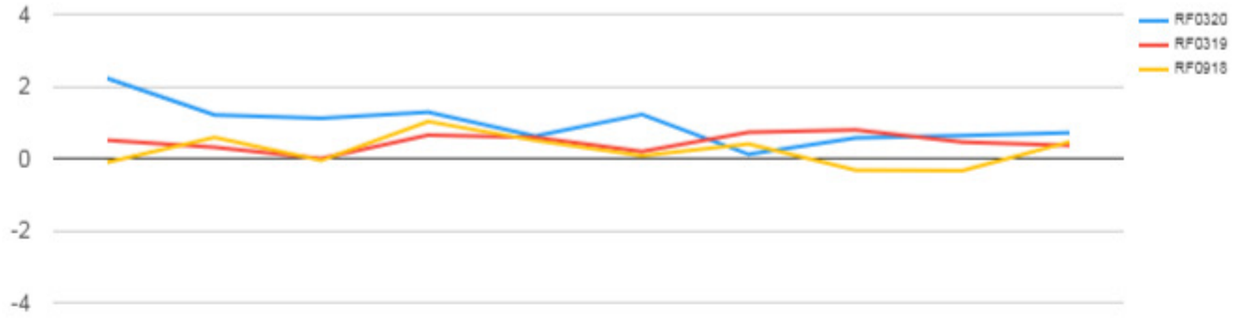
Interpretation Z-Score				
Z-Score<-3	-3<Z-Score<-2	-2<Z-Score<2	2<Z-Score<3	Z-Score>3
Poor	Moderate	Good	Moderate	Poor

ZSCORE-PT - fat_ref



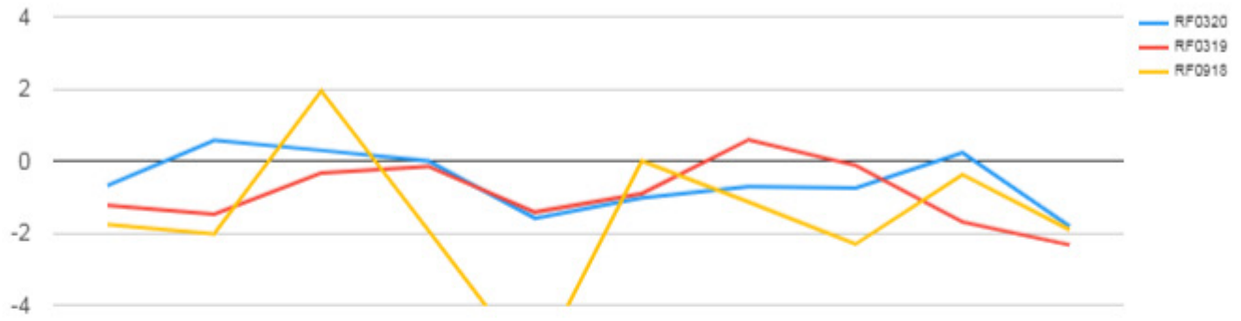
ICAR	Round	Type	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	Yellow	Red	White
1	RF0320	fat_ref	1.3	1.2	2.1	0.6	2.3	2.1	1.3	1.3	6.8	0.3	30%	10%	60%
1	RF0319	fat_ref	0.3	0.6	0.7	1.1	1.0	0.0	1.3	0.7	1.6	2.2	10%	0%	90%
1	RF0918	fat_ref	0.1	0.6	0.9	-0.3	1.5	-0.1	1.1	-0.4	-0.1	0.4	0%	0%	100%
1	RF0318	fat_ref	0.2	0.3	0.2	0.8	0.1	-0.2	-0.3	-0.2	0.6	0.2	0%	0%	100%
1	RF0917	fat_ref	-1.9	0.8	1.6	1.2	50.9	-0.7	0.8	0.9	2.6	0.7	10%	10%	80%
1	RF0317	fat_ref	0.7	0.4	0.3	0.3	0.5	0.2	0.9	0.6	-0.5	0.3	0%	0%	100%
1	RF0916	fat_ref	1.4	-1.1	-0.3	-0.7	-0.9	3.7	-0.4	0.5	-0.0	-0.5	0%	10%	90%
1	RF0316	fat_ref	1.8	1.8	1.8	0.8	1.7	1.0	1.5	1.6	0.8	0.6	0%	0%	100%

ZSCORE-FIX - fat_ref



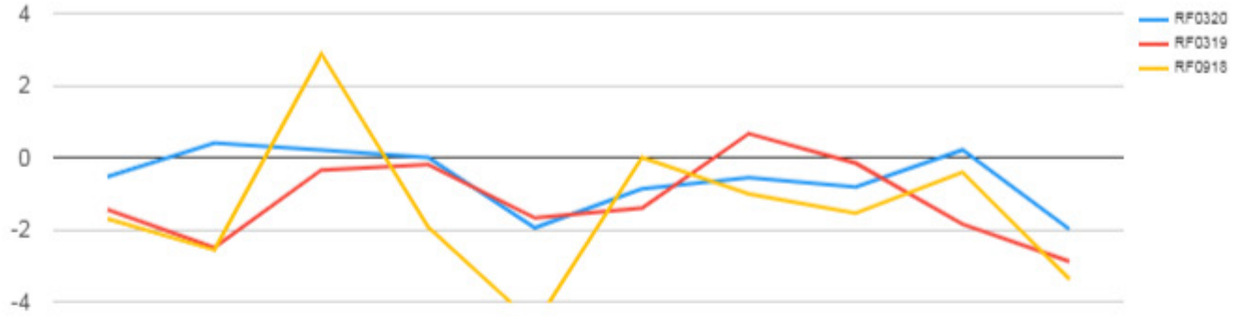
ICAR	Round	Type	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	Yellow	Red	White
1	RF0320	fat_ref	1.2	0.7	1.2	0.6	1.3	1.1	0.6	0.6	2.2	0.1	10%	0%	90%
1	RF0319	fat_ref	0.2	0.4	0.3	0.8	0.7	0.0	0.6	0.4	0.5	0.7	0%	0%	100%
1	RF0918	fat_ref	0.1	0.5	0.6	-0.3	1.0	-0.0	0.5	-0.3	-0.1	0.4	0%	0%	100%
1	RF0318	fat_ref	0.2	0.2	0.1	1.0	0.1	-0.1	-0.4	-0.1	0.4	0.1	0%	0%	100%
1	RF0917	fat_ref	-0.8	0.9	0.6	0.7	25.6	-0.3	0.6	0.5	1.4	0.6	0%	10%	90%
1	RF0317	fat_ref	0.8	0.2	0.2	0.2	0.3	0.1	0.7	0.5	-0.2	0.1	0%	0%	100%
1	RF0916	fat_ref	0.6	-0.5	-0.2	-0.5	-0.8	2.2	-0.2	0.4	-0.0	-0.3	10%	0%	90%
1	RF0316	fat_ref	1.8	1.2	1.1	0.5	1.1	0.5	1.2	0.8	0.7	0.7	0%	0%	100%

ZSCORE-PT - protein_ref



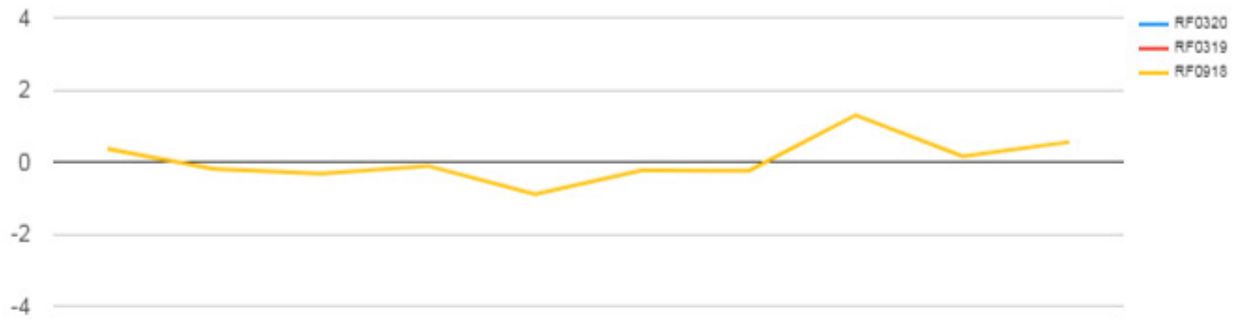
ICAR	Round	Type	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	Yellow	Red	White
1	RF0320	protein_ref	-1.6	-0.8	-0.7	-1.8	0.3	0.6	0.0	0.2	-1.0	-0.7	0%	0%	100%
1	RF0319	protein_ref	-1.4	-0.1	-1.2	-2.3	-0.3	-1.5	-0.2	-1.7	-0.9	0.6	10%	0%	90%
1	RF0918	protein_ref	-5.8	-2.3	-1.8	-1.9	1.9	-2.0	-1.9	-0.4	0.0	-1.1	20%	10%	70%
1	RF0318	protein_ref	-1.5	-0.4	-1.0	-1.7	0.7	-0.8	-1.1	-0.2	-0.6	-0.8	0%	0%	100%
1	RF0917	protein_ref	1.0	-0.7	-0.4	1.1	1.4	0.4	-0.7	0.4	-1.5	0.6	0%	0%	100%
1	RF0317	protein_ref	-0.7	-0.8	0.0	1.8	1.5	0.3	4.9	1.4	1.9	0.0	0%	10%	90%
1	RF0916	protein_ref	-9.7	-11.8	-12.0	-13.7	-9.9	-10.5	-16.9	-15.3	-12.6	-9.2	0%	100%	0%
1	RF0316	protein_ref	-4.3	-1.6	-1.9	-2.1	-0.1	-3.7	-0.8	-1.8	-0.6	-8.8	10%	30%	60%

ZSCORE-FIX - protein_ref



ICAR	Round	Type	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	Yellow	Red	White
1	RF0320	protein_ref	-2.0	-0.8	-0.5	-2.0	0.2	0.4	0.0	0.2	-0.9	-0.6	20%	0%	80%
1	RF0319	protein_ref	-1.7	-0.2	-1.4	-2.9	-0.4	-2.5	-0.2	-1.9	-1.4	0.7	20%	0%	80%
1	RF0918	protein_ref	-4.6	-1.5	-1.7	-3.4	2.9	-2.6	-1.9	-0.4	0.0	-1.0	20%	20%	60%
1	RF0318	protein_ref	-1.8	-0.6	-1.1	-3.2	0.8	-1.8	-1.5	-0.2	-0.7	-1.0	0%	10%	90%
1	RF0917	protein_ref	1.3	-0.7	-0.5	1.1	1.3	0.3	-0.6	0.6	-2.5	0.7	10%	0%	90%
1	RF0317	protein_ref	-0.7	-0.7	0.0	1.8	1.6	0.3	5.6	1.3	2.1	0.0	10%	10%	80%
1	RF0916	protein_ref	-8.7	-12.1	-12.7	-12.2	-11.5	-11.7	-11.9	-11.8	-12.6	-11.7	0%	100%	0%
1	RF0316	protein_ref	-4.1	-1.7	-2.2	-2.6	-0.1	-4.4	-0.9	-1.5	-0.6	-13.3	20%	30%	50%

ZSCORE-PT - urea_ref

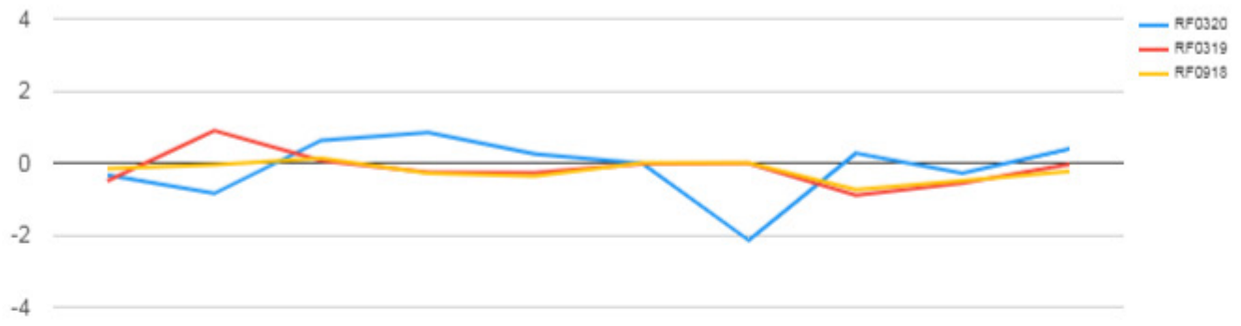


ICAR	Round	Type	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	Yellow	Red	White
1	RF0320	urea_ref	-23.7	-15.2	-8.1	-8.5	-16.5	-19.6	-8.2	-7.7	-8.5	-7.3	0%	100%	0%
1	RF0319	urea_ref	-8.3	-7.6	-6.8	-8.1	-5.1	-7.6	-5.8	-6.9	-8.9	-8.9	0%	100%	0%
1	RF0918	urea_ref	1.3	0.6	-0.1	-0.3	-0.9	-0.2	-0.2	0.4	0.2	-0.2	0%	0%	100%
1	RF0317	urea_ref	2.0	2.4	2.3	0.1	1.1	1.4	2.1	1.1	1.2	1.9	40%	0%	60%
1	RF0916	urea_ref	0.3	0.4	-0.2	0.1	0.2	0.5	0.3	-0.1	-0.2	-0.2	0%	0%	100%
1	RF0316	urea_ref	0.3	0.5	0.0	0.4	-1.3	-1.3	-0.2	-0.7	-0.9	-0.2	0%	0%	100%

ZSCORE-FIX - urea_ref

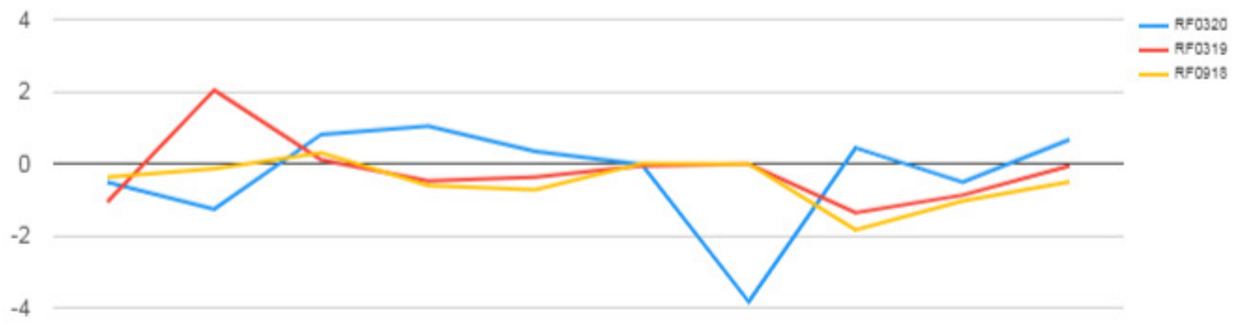
ICAR	Round	Type	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	Yellow	Red	White
1	RF0320	urea_ref	-15.1	-17.6	-9.5	-8.0	-10.9	-13.5	-6.7	-5.5	-16.2	-12.5	0%	100%	0%
1	RF0319	urea_ref	-5.8	-12.7	-8.9	-9.8	-11.2	-14.1	-7.1	-14.7	-16.4	-17.9	0%	100%	0%
1	RF0918	urea_ref	0.4	0.2	-0.1	-0.1	-0.1	-0.2	-0.0	0.1	0.2	-0.3	0%	0%	100%
1	RF0317	urea_ref	1.5	1.7	1.5	0.8	1.0	0.8	1.4	0.9	1.1	1.5	0%	0%	100%
1	RF0916	urea_ref	0.3	0.3	-0.2	0.1	0.1	0.4	0.2	-0.0	-0.1	-0.1	0%	0%	100%
1	RF0316	urea_ref	0.2	0.2	0.0	0.2	-0.8	-1.0	-0.1	-0.9	-0.9	-0.2	0%	0%	100%

ZSCORE-PT - scc_ref

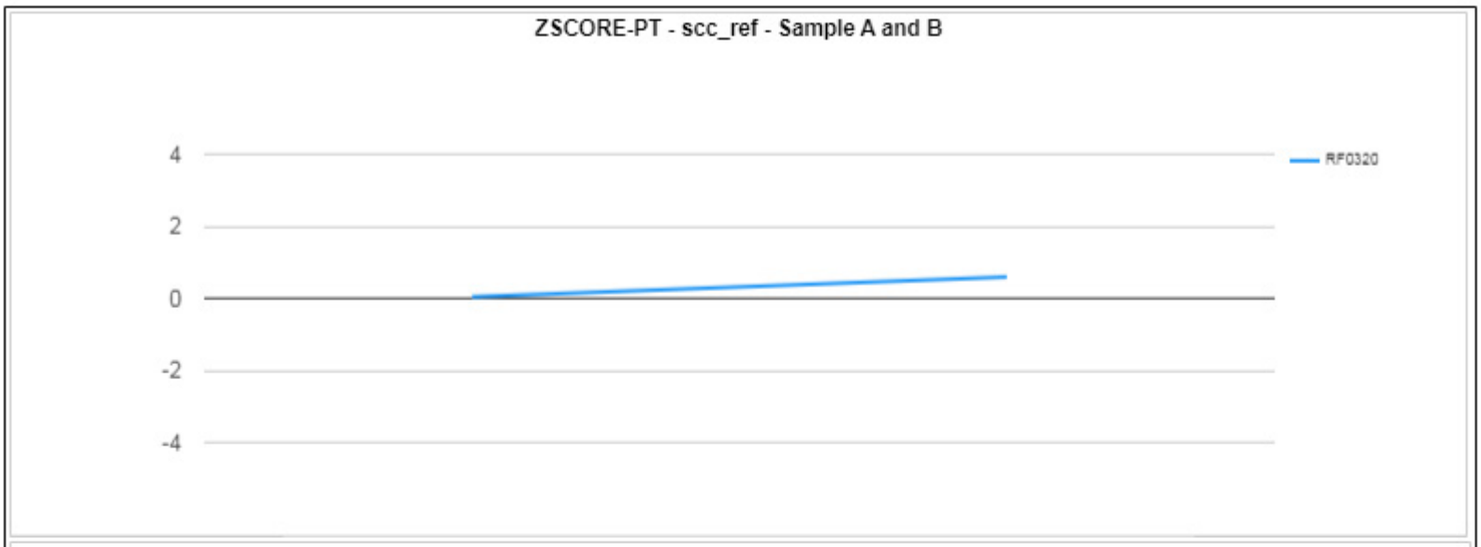


ICAR	Round	Type	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	Yellow	Red	White
1	RF0320	scc_ref	0.3	-0.3	0.8	0.2	0.6	0.4	-2.1	-0.0	-0.3	-0.8	10%	0%	90%
1	RF0319	scc_ref	-0.9	-0.6	-0.3	-0.3	0.1	-0.0	-0.0	-0.0	-0.5	0.9	0%	0%	100%
1	RF0918	scc_ref	-0.7	-0.5	-0.3	-0.4	0.1	-0.2	-0.0	0.0	-0.2	-0.1	0%	0%	100%
1	RF0318	scc_ref	-0.1	-0.0	0.5	-0.1	0.0	-0.3	-0.2	-0.7	-0.0	0.4	0%	0%	100%
1	RF0917	scc_ref	-0.3	-0.6	-0.4	-0.6	-0.5	-0.6	-0.5	-0.6	-0.6	-0.6	0%	0%	100%
1	RF0317	scc_ref	-1.2	-1.0	-1.2	-0.6	-0.8	-0.5	-0.7	-1.0	-1.2	-0.5	0%	0%	100%
1	RF0916	scc_ref	0.9	-0.0	0.5	-0.8	-0.5	-0.3	0.0	-0.1	0.2	-0.1	0%	0%	100%
1	RF0316	scc_ref	-0.6	-0.5	-1.0	-0.7	-0.4	-0.7	-0.8	-0.5	-0.4	-0.7	0%	0%	100%

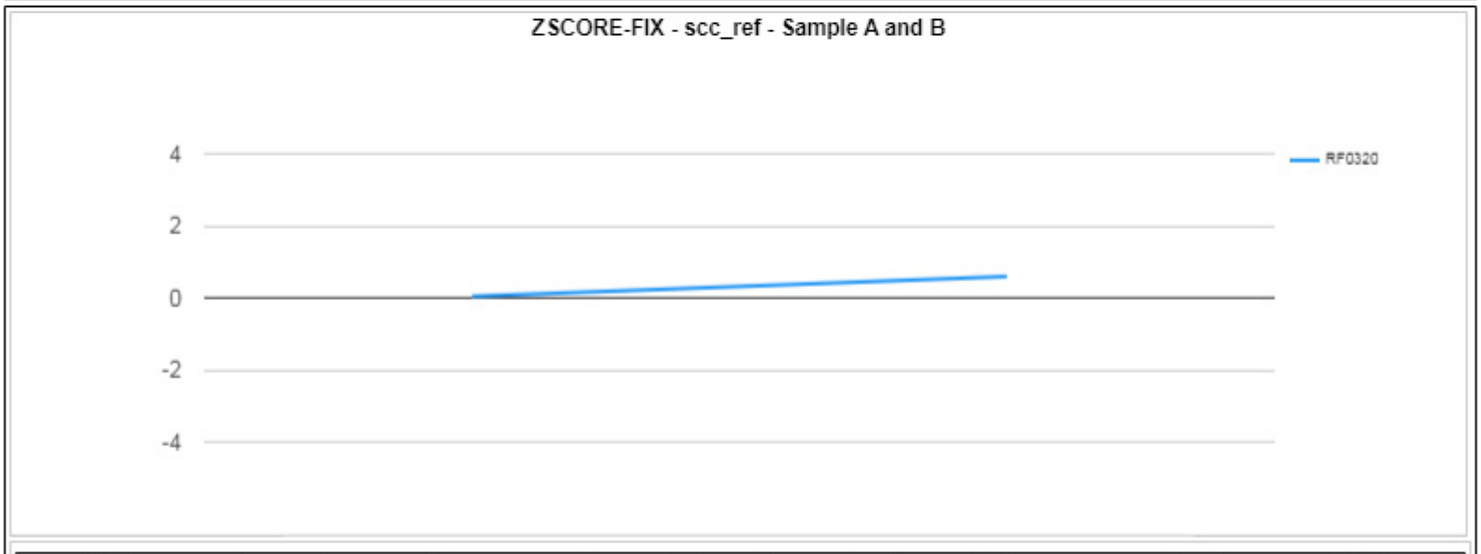
ZSCORE-FIX - scc_ref



ICAR	Round	Type	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	Yellow	Red	White
1	RF0320	scc_ref	0.4	-0.5	1.0	0.3	0.8	0.7	-3.8	-0.0	-0.5	-1.3	0%	10%	90%
1	RF0319	scc_ref	-1.4	-0.9	-0.5	-0.4	0.1	-0.1	-0.0	-0.1	-1.1	2.0	10%	0%	90%
1	RF0918	scc_ref	-1.8	-1.0	-0.6	-0.7	0.3	-0.5	-0.0	0.0	-0.4	-0.1	0%	0%	100%
1	RF0318	scc_ref	-0.3	-0.0	0.8	-0.4	0.1	-0.5	-0.4	-1.3	-0.0	1.0	0%	0%	100%
1	RF0917	scc_ref	-0.7	-2.1	-1.2	-1.5	-1.5	-2.1	-1.7	-2.3	-1.5	-2.1	40%	0%	60%
1	RF0317	scc_ref	-1.7	-1.3	-1.6	-1.2	-1.3	-0.8	-1.3	-1.2	-2.4	-1.0	10%	0%	90%
1	RF0916	scc_ref	1.3	-0.0	0.8	-1.2	-0.8	-0.5	0.0	-0.1	0.3	-0.3	0%	0%	100%
1	RF0316	scc_ref	-1.2	-0.9	-1.1	-0.9	-0.5	-1.2	-1.1	-0.6	-0.5	-1.0	0%	0%	100%



ICAR	Round	Type	Sample A	Sample B	Yellow	Red	White
1	RF0320	Zscore-pt-scc_ref	0.0	0.6	0%	0%	100%



ICAR	Round	Type	Sample A	Sample B	Yellow	Red	White
1	RF0320	Zscore-fix-scc_ref	0.0	0.6	0%	0%	100%

Chemical Reference Methods
Laboratory participation codes and Performance analyses

ICAR PT RF0320

Laboratory Name	

A

Your participation Codes					
Subscription	Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	$SCC_{ref/alt}$
	No	No	No	No	Yes
Participation Codes					4
Are all the sample results received?	No	No	No	No	Yes

B

Data results received on time	
Yes	21-03-2020

C

Have you sent the data with the correct units of measurements?					
	Fat_{ref}	$Protein^{*}_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	$SCC_{ref/alt}$
	g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
					Yes

** It was requested to report the value in total nitrogen*

D

Ranking of your lab					
	Fat_{ref}	$Protein^{*}_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	$SCC_{ref/alt}$
	g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
Code					4
%					10%
d					1%
Sd					2%
D					2%
Method					ISO 13366-2 IDF 148-2
Limits					
d	0,020	0,025	0,10	2,5	10%
Sd	0,030	0,020	0,10	1,5	10%

E

Outliers					
	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					
Sample 2					
Sample 3					
Sample 4					
Sample 5					
Sample 6					
Sample 7					
Sample 8					
Sample 9					
Sample 10					

F

Repeatability					
Your "r" performance					
	Fat	Protein	Lactose	Urea	SCC
	g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
Sample 1					1
Sample 2					2
Sample 3					1
Sample 4					1
Sample 5					1
Sample 6					9
Sample 7					9
Sample 8					4
Sample 9					1
Sample 10					5

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	Protein	Lactose	Urea	SCC
g/100g	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

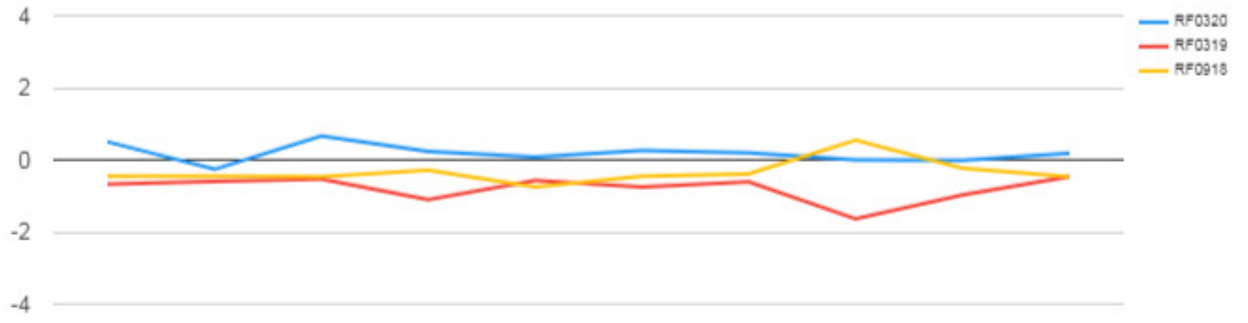
Your Z-Score PT					
	Fat	Protein	Lactose	Urea	SCC
Sample 1					0.00
Sample 2					0.00
Sample 3					0.20
Sample 4					0.10
Sample 5					0.70
Sample 6					0.20
Sample 7					0.20
Sample 8					0.30
Sample 9					0.50
Sample 10					-0.30

Your Z-Score Fix					
	Fat	Protein	Lactose	Urea	SCC
Sample 1					0.00
Sample 2					0.00
Sample 3					0.30
Sample 4					0.10
Sample 5					0.80
Sample 6					0.30
Sample 7					0.30
Sample 8					0.40
Sample 9					0.80
Sample 10					-0.40

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.

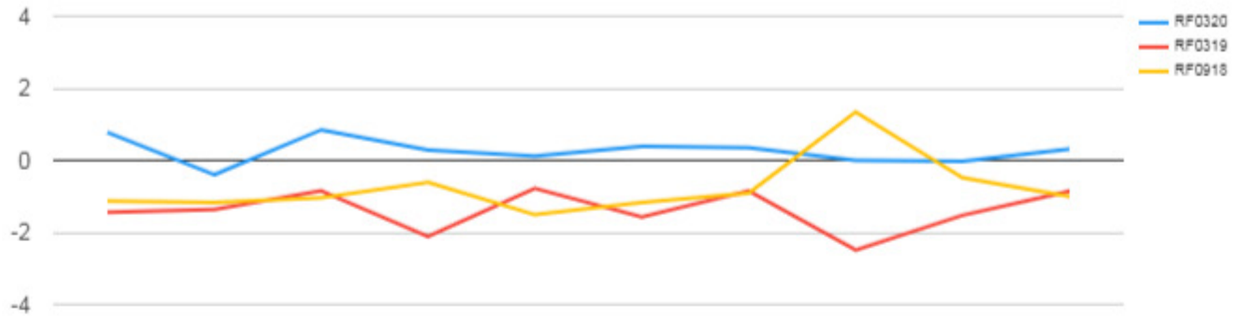
Interpretation Z-Score				
Z-Score<-3	-3<Z-Score<-2	-2<Z-Score<2	2<Z-Score<3	Z-Score>3
Poor	Moderate	Good	Moderate	Poor

ZSCORE-PT - scc_ref

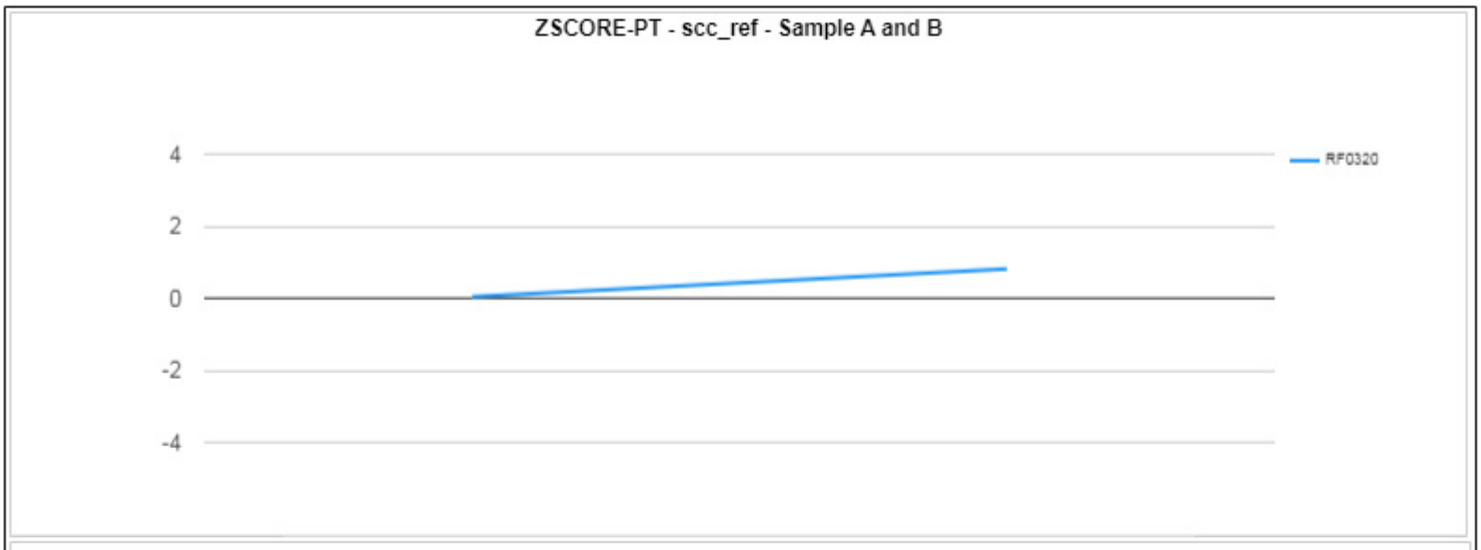


ICAR	Round	Type	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	Yellow	Red	White
4	RF0320	scc_ref	-0.0	-0.0	0.2	0.1	0.7	0.2	0.2	0.3	0.5	-0.3	0%	0%	100%
2	RF0319	scc_ref	-0.5	-0.6	-0.2	-0.2	-0.1	-0.3	-0.2	-0.2	-0.2	-0.0	0%	0%	100%
30	RF0918	scc_ref	-0.7	-0.5	-0.3	-0.4	0.1	-0.2	-0.0	0.0	-0.2	-0.1	0%	0%	100%
34	RF0318	scc_ref	-0.2	-0.1	0.1	-0.2	-0.1	-0.4	-0.1	-0.2	0.1	0.1	0%	0%	100%
39	RF0917	scc_ref	-0.3	-0.6	-0.4	-0.5	-0.5	-0.6	-0.5	-0.6	-0.5	-0.6	0%	0%	100%
2	RF0316	scc_ref	-0.6	-0.5	-0.9	-1.9	-0.4	-0.6	-0.7	-0.4	-0.4	-0.7	0%	0%	100%

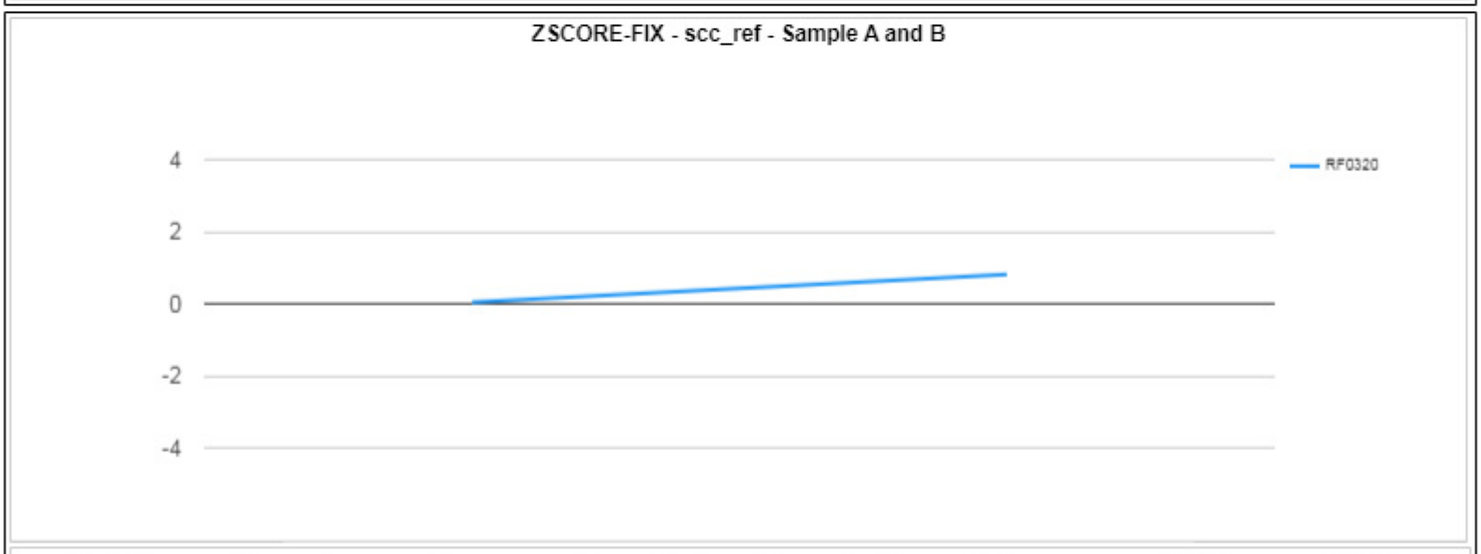
ZSCORE-FIX - scc_ref



ICAR	Round	Type	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	Yellow	Red	White
4	RF0320	scc_ref	-0.0	-0.0	0.3	0.1	0.8	0.3	0.3	0.4	0.8	-0.4	0%	0%	100%
2	RF0319	scc_ref	-0.7	-0.9	-0.3	-0.3	-0.2	-0.5	-0.3	-0.4	-0.4	-0.0	0%	0%	100%
30	RF0918	scc_ref	-1.8	-1.0	-0.6	-0.7	0.3	-0.5	-0.0	0.0	-0.4	-0.1	0%	0%	100%
34	RF0318	scc_ref	-0.4	-0.2	0.2	-0.6	-0.3	-0.6	-0.4	-0.4	0.2	0.2	0%	0%	100%
39	RF0917	scc_ref	-0.8	-2.2	-1.1	-1.4	-1.6	-2.1	-1.6	-2.3	-1.4	-2.1	40%	0%	60%
2	RF0316	scc_ref	-1.2	-0.9	-1.0	-2.5	-0.5	-1.1	-0.9	-0.6	-0.5	-1.0	10%	0%	90%



ICAR	Round	Type	Sample A	Sample B	Yellow	Red	White
1-1	RF0320	Zscore-pt-scc_ref	0.0	0.8	0%	0%	100%



ICAR	Round	Type	Sample A	Sample B	Yellow	Red	White
1-1	RF0320	Zscore-fix-scc_ref	0.0	0.8	0%	0%	100%

ICAR

PROFICIENCY TESTING SCHEME

March 2020

Raw Milk

Determination of FAT CONTENT

Röse Gottlieb method

Sending date of statistical treatment : 8th April 2020

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

Proficiency test accreditated ISO 17043

ACCRÉDITATION N° 1-2473 PORTÉE DISPONIBLE SUR WWW.COFRAC.FR

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

Nb	%	N°	d	Sd	D	Method
1	8	8	+ 0,004	0,004	0,006	A
2	17	2	- 0,005	0,003	0,006	A
3	25	5	+ 0,004	0,005	0,007	A
4	33	6	- 0,004	0,006	0,007	A
5	42	10	+ 0,004	0,008	0,009	A
6	50	11	- 0,003	0,009	0,010	A
7	58	4	+ 0,009	0,005	0,011	A
8	67	9	- 0,009	0,010	0,013	A
9	75	7	- 0,011	0,009	0,014	A
10	83	12	- 0,000	0,019	0,019	A
11	92	1	+ 0,019	0,012	0,023	A
12	100	3	- 0,033	0,058	0,067	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 12 laboratories using the reference method ISO 1211|IDF 1, after outliers discarging using Grubbs test at 5% risk level,

A ISO 1211|IDF 1 Röse Gottlieb 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.(d^2 + Sd^2))

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}	0,006
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,013

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	0,003	0,001	0,010	0,007	0,000	0,003	0,001	0,006	0,003	0,004	0,003	20
2	0,019	0,002	0,005	0,000	0,002	0,008	0,016	0,007	0,006	0,005	0,006	20
3	0,008	0,003	0,012	0,010	0,005	0,000	0,008	0,008	0,001	0,007	0,005	20
4	0,006	0,005	0,002	0,003	0,002	0,003	0,004	0,006	0,004	0,004	0,003	20
5	0,013	0,003	0,000	0,000	0,000	0,001	0,006	0,017	0,009	0,013	0,006	20
6	0,008	0,004	0,000	0,007	0,001	0,006	0,004	0,006	0,003	0,000	0,003	20
7	0,008	0,007	0,007	0,002	0,003	0,002	0,003	0,005	0,004	0,004	0,003	20
8	0,011	0,003	0,005	0,000	0,001	0,002	0,006	0,011	0,002	0,002	0,004	20
9	0,009	0,007	**	0,019	0,014	0,001	0,001	**	**	0,015	0,008	14
10	0,007	0,005	0,002	0,003	0,010	0,005	0,004	0,005	0,007	0,011	0,005	20
11	0,007	0,022	0,001	0,008	0,007	0,014	0,011	0,001	0,010	0,008	0,008	20
12	0,000	0,020	0,010	0,020	0,020	0,020	0,020	0,020	0,000	0,000	0,011	20
Sr	0,007	0,007	0,005	0,007	0,006	0,006	0,006	0,007	0,004	0,005		234
NE	24	24	22	24	24	24	24	22	22	24		
L	0,024	0,024	0,016	0,024	0,021	0,020	0,023	0,025	0,014	0,020		

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	3,589	4,731	2,238	4,113	2,918	2,454	3,156	4,565	1,591 *	3,887
2	3,556	4,715	2,206	4,099	2,884	2,422	3,142	4,549	1,543	3,879
3	3,560	4,559 *	2,203	4,056	2,902	2,446	3,137	4,546	1,541	3,767 *
4	3,574	4,731	2,216	4,121	2,900	2,436	3,153	4,567	1,552	3,891
5	3,559	4,726	2,215	4,112	2,895	2,434	3,152	4,560	1,550	3,889
6	3,548	4,711	2,212	4,095	2,885	2,430	3,146	4,548	1,550	3,885
7	3,537	4,701	2,194	4,097	2,877	2,419	3,138	4,542	1,540	3,889
8	3,562	4,726	2,213	4,105	2,896	2,433	3,147	4,564	1,547	3,890
9	3,573	4,707		4,077	2,886	2,420	3,136			3,872
10	3,567	4,727	2,220	4,120	2,895	2,433	3,139	4,545	1,545	3,900
11	3,559	4,697	2,215	4,111	2,900	2,436	3,144	4,541	1,539	3,873
12	3,610	4,710	2,225	4,090	2,880	2,420	3,120	4,550	1,560	3,880
M	3,566	4,716	2,214	4,099	2,893	2,432	3,142	4,552	1,547	3,885
REF.	3,564	4,716	2,214	4,101	2,892	2,431	3,143	4,552	1,546	3,885
SD	0,019	0,012	0,012	0,019	0,011	0,011	0,010	0,010	0,007	0,008

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 12 laboratories using the reference method ISO 1211 | IDF 1, 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		3								
Outlier Grubbs									1	3
sr	0,007	0,007	0,005	0,007	0,006	0,006	0,006	0,007	0,004	0,005
SR	0,020	0,013	0,012	0,019	0,012	0,011	0,011	0,011	0,007	0,009

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	+ 0,024	+ 0,014	+ 0,024	+ 0,011	+ 0,026	+ 0,022	+ 0,012	+ 0,013	+ 0,044	+ 0,002	+ 0,019	0,012	5,32
2	- 0,009	- 0,001	- 0,008	- 0,002	- 0,008	- 0,009	- 0,001	- 0,004	- 0,003	- 0,006	- 0,005	0,003	5,01
3	- 0,004	- 0,158	- 0,011	- 0,045	+ 0,009	+ 0,015	- 0,006	- 0,006	- 0,006	- 0,118	- 0,033	0,058	1,79
4	+ 0,010	+ 0,014	+ 0,002	+ 0,019	+ 0,008	+ 0,004	+ 0,010	+ 0,015	+ 0,006	+ 0,006	+ 0,009	0,005	5,61
5	- 0,006	+ 0,009	+ 0,001	+ 0,011	+ 0,003	+ 0,002	+ 0,009	+ 0,007	+ 0,003	+ 0,004	+ 0,004	0,005	2,83
6	- 0,017	- 0,005	- 0,002	- 0,006	- 0,008	- 0,001	+ 0,003	- 0,004	+ 0,004	+ 0,000	- 0,004	0,006	1,92
7	- 0,027	- 0,016	- 0,020	- 0,004	- 0,016	- 0,012	- 0,006	- 0,011	- 0,006	+ 0,004	- 0,011	0,009	3,99
8	- 0,003	+ 0,009	- 0,001	+ 0,004	+ 0,003	+ 0,002	+ 0,004	+ 0,011	+ 0,001	+ 0,005	+ 0,004	0,004	2,59
9	+ 0,008	- 0,010		- 0,025	- 0,006	- 0,012	- 0,008			- 0,013	- 0,009	0,010	2,51
10	+ 0,002	+ 0,010	+ 0,006	+ 0,018	+ 0,003	+ 0,001	- 0,004	- 0,008	- 0,002	+ 0,015	+ 0,004	0,008	1,63
11	- 0,006	- 0,019	+ 0,001	+ 0,010	+ 0,007	+ 0,005	+ 0,000	- 0,012	- 0,007	- 0,012	- 0,003	0,009	1,09
12	+ 0,046	- 0,006	+ 0,011	- 0,011	- 0,012	- 0,011	- 0,023	- 0,002	+ 0,014	- 0,005	- 0,000	0,019	0,00
d	+ 0,002	- 0,000	+ 0,000	- 0,002	+ 0,001	+ 0,000	- 0,001	- 0,000	+ 0,000	+ 0,000	- 0,002	0,022	
Sd	0,019	0,012	0,012	0,019	0,011	0,011	0,010	0,010	0,007	0,008	0,012		

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

Upper limits : $\bar{d}$ = +/- 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	+1,27	+1,18	+2,08	+0,61	+2,25	+2,08	+1,28	+1,31	+6,80	+0,27
2	-0,46	-0,10	-0,71	-0,11	-0,72	-0,86	-0,12	-0,38	-0,48	-0,75
3	-0,23	-13,05	-0,92	-2,40	+0,81	+1,38	-0,64	-0,64	-0,86	-14,17
4	+0,51	+1,18	+0,19	+1,04	+0,68	+0,40	+1,02	+1,52	+0,90	+0,75
5	-0,30	+0,77	+0,11	+0,58	+0,24	+0,21	+0,92	+0,75	+0,52	+0,45
6	-0,88	-0,41	-0,14	-0,34	-0,66	-0,14	+0,27	-0,40	+0,58	+0,04
7	-1,43	-1,30	-1,74	-0,22	-1,37	-1,14	-0,58	-1,10	-0,93	+0,51
8	-0,15	+0,77	-0,11	+0,21	+0,29	+0,17	+0,40	+1,16	+0,14	+0,63
9	+0,43	-0,81		-1,31	-0,54	-1,09	-0,79			-1,59
10	+0,11	+0,85	+0,54	+0,98	+0,24	+0,12	-0,43	-0,79	-0,25	+1,77
11	-0,30	-1,59	+0,07	+0,53	+0,64	+0,45	+0,04	-1,20	-1,09	-1,41
12	+2,39	-0,52	+0,97	-0,59	-1,07	-1,0	-2,4	-0,23	+2,1	-0,57

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

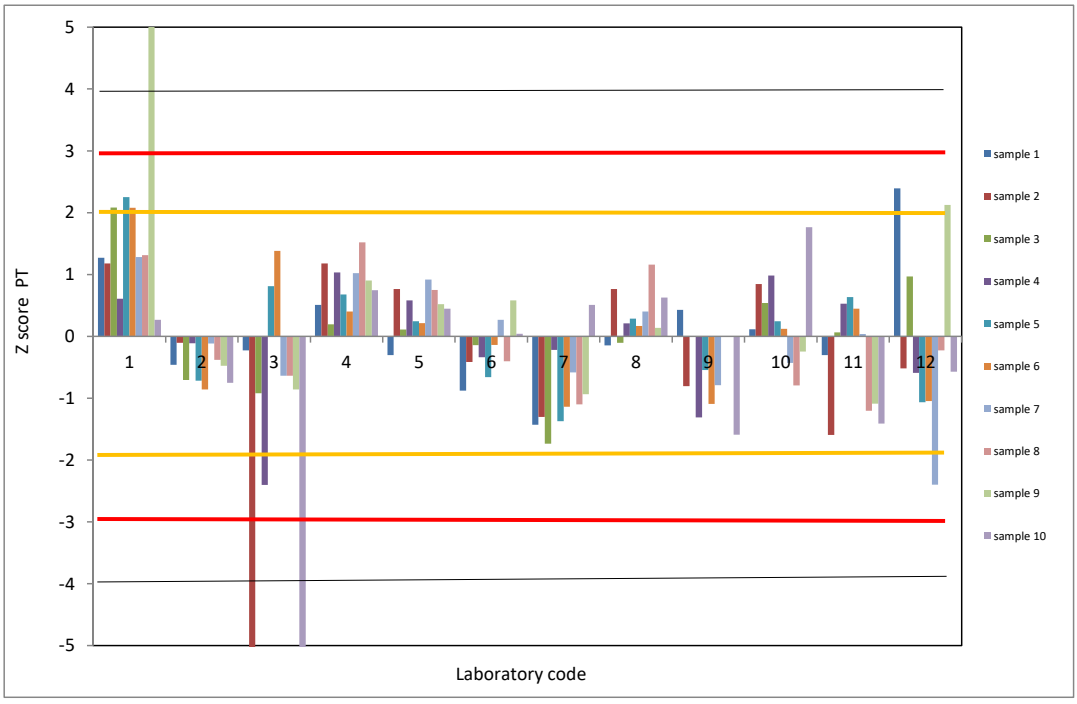


Table VII : Zscore of the different laboratories for each sample.
ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+1,21	+0,71	+1,21	+0,57	+1,29	+1,11	+0,62	+0,64	+2,22	+0,11
2	-0,44	-0,06	-0,41	-0,10	-0,41	-0,46	-0,06	-0,19	-0,16	-0,31
3	-0,22	-7,89	-0,54	-2,25	+0,46	+0,74	-0,31	-0,31	-0,28	-5,91
4	+0,48	+0,71	+0,11	+0,97	+0,39	+0,21	+0,49	+0,74	+0,29	+0,31
5	-0,29	+0,46	+0,06	+0,55	+0,14	+0,11	+0,44	+0,36	+0,17	+0,19
6	-0,84	-0,25	-0,08	-0,32	-0,38	-0,07	+0,13	-0,20	+0,19	+0,02
7	-1,37	-0,79	-1,01	-0,20	-0,79	-0,61	-0,28	-0,54	-0,31	+0,21
8	-0,14	+0,46	-0,06	+0,20	+0,16	+0,09	+0,19	+0,56	+0,04	+0,26
9	+0,41	-0,49		-1,23	-0,31	-0,59	-0,38			-0,66
10	+0,11	+0,51	+0,31	+0,92	+0,14	+0,06	-0,21	-0,39	-0,08	+0,74
11	-0,29	-0,96	+0,04	+0,50	+0,36	+0,24	+0,02	-0,59	-0,36	-0,59
12	+2,28	-0,31	+0,56	-0,55	-0,61	-0,56	-1,2	-0,11	+0,69	-0,24

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

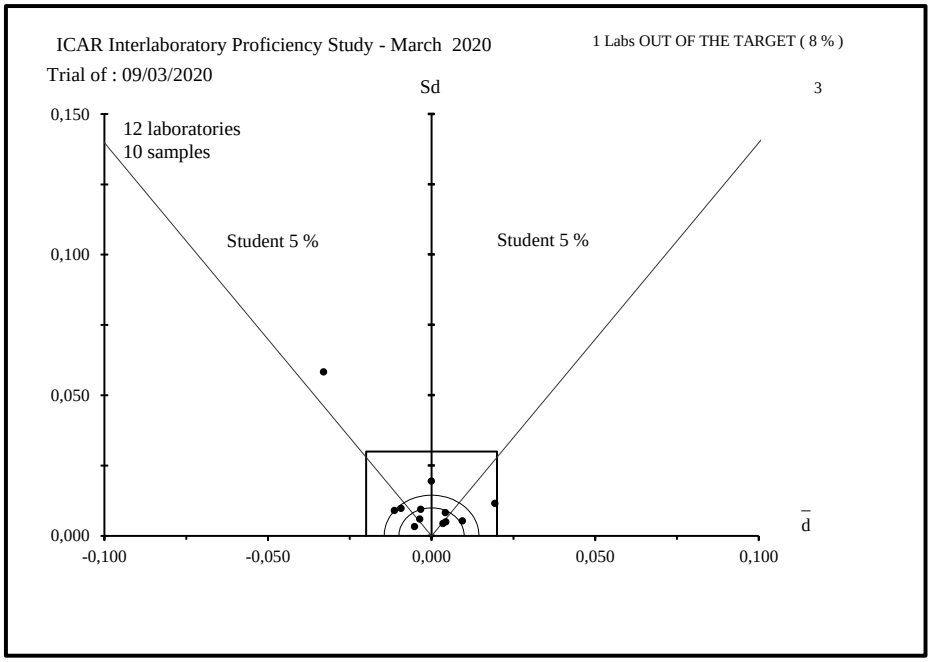


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST

RAW MILK
FAT CONTENT Röse Göttlieb
March 2020

Name	City	Country
Actalia	Poligny	France
Agroscope Institute for food Sciences IFS	Bern-Liebefeld	Switzerland
AIA-Laboratorio Standard Latte	Maccarese (RM)	Italy
Department Valorisation des productions Agricoles	Gembloux	Belgium
Eastern Lab services	Medina	USA
Estonian Livestock Performance Recording Ltd	Tartu	Estonie
Japan Dairy Technical Association	Tokyo	Japan
Lactanet	Quebec	Canada
Milchkontroll und Rinderzuchtverband eG	Güstrow	Germany
Milkom a.s Dairy research institute	Praha	Czech Republic
Qlip B.V.,	Zutphen	Netherlands
Univ. of Ljubljana dept. of Animal Sc. Inst. of Dairy Sc. and Probiotics	Domzale	Slovenia

ICAR

PROFICIENCY TESTING SCHEME

March 2020

Raw Milk

Determination of CRUDE PROTEIN CONTENT

KJELDAHL Method

Sending date of statistical treatment : 8th April 2020

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

Proficiency test accreditated ISO 17043

ACCRÉDITATION N° 1-2473 PORTÉE DISPONIBLE SUR WWW.COFRAC.FR

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

Nb	%	N°	d	Sd	D	Method
1	8	7	- 0,000	0,005	0,005	ISO 8968-1 | IDF 20-3
2	17	4	- 0,002	0,006	0,007	ISO 8968-1 | IDF 20-1
3	25	2	- 0,003	0,006	0,007	ISO 8968-1 | IDF 20-1
4	33	5	- 0,005	0,006	0,008	ISO 8968-1 | IDF 20-3
5	42	3	+ 0,004	0,008	0,009	ISO 8968-1 | IDF 20-1
6	50	11	+ 0,007	0,008	0,011	ISO 8968-1 | IDF 20-1
7	58	6	- 0,005	0,011	0,013	ISO 8968-1 | IDF 20-1
8	67	1	- 0,012	0,016	0,020	ISO 8968-1 | IDF 20-1
9	75	10	- 0,017	0,012	0,020	ISO 8968-1 | IDF 20-1
10	83	12	- 0,017	0,012	0,021	ISO 8968-1 | IDF 20-1
11	92	8	+ 0,022	0,004	0,022	ISO 8968-1 | IDF 20-1
12	100	9	+ 0,029	0,006	0,030	ISO 8968-1 | IDF 20-1

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 12 laboratories using the reference method (ISO 8968-1|IDF 20-1), after outlier discarging using Grubbs test at 5% risk level

N.B. : N° 5 and N° 7 : 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.(d^2 + Sd^2))

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}	0,007
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,017

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	0,020	0,010	0,010	0,000	0,000	**	0,010	0,010	0,010	0,007	18
2	0,027	0,009	0,010	0,014	0,010	0,006	0,004	0,004	0,009	0,027	0,010	20
3	0,023	0,007	0,011	0,025	0,010	0,003	0,008	0,010	0,011	0,006	0,009	20
4	0,000	0,001	0,002	0,001	0,005	0,001	0,004	0,003	0,004	0,001	0,002	20
5	0,005	0,003	0,002	0,002	0,006	0,002	0,000	0,006	0,002	0,006	0,003	20
6	0,006	0,006	0,001	0,005	0,004	0,017	0,014	0,020	0,024	0,008	0,009	20
7	0,006	0,013	0,013	0,019	0,000	0,006	0,000	0,019	0,013	0,006	0,008	20
8	0,007	0,003	0,007	0,005	0,004	0,006	0,008	0,004	0,004	0,005	0,004	20
9	0,001	0,003	0,010	0,004	0,002	**	0,005	0,001	0,002	0,011	0,004	18
10	0,012	0,014	0,008	0,009	0,001	0,011	0,009	0,004	0,003	0,021	0,008	20
11	0,003	0,003	0,008	0,001	0,002	0,006	0,017	0,001	0,008	0,010	0,005	20
12	0,021	0,018	0,020	0,009	0,019	0,004	0,026	0,008	0,003	0,008	0,011	20
Sr	0,009	0,007	0,007	0,008	0,005	0,005	0,008	0,007	0,007	0,009		236
NE	24	24	24	24	24	22	22	24	24	24		
L	0,033	0,026	0,025	0,029	0,019	0,018	0,029	0,025	0,025	0,031		

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

(*) : Data were to modify in right units.

Sample \ Lab code	1	2	3	4	5	6	7	8	9	10
(*) 1	3,255	3,649	2,728	3,663	2,926	2,828		3,669	3,290	3,467
2	3,283	3,674	2,735	3,692	2,920	2,816	3,072	3,663	3,307	3,471
3	3,279	3,660	2,743	3,713	2,923	2,826	3,085	3,668	3,311	3,494
4	3,299	3,665	2,736	3,699	2,907	2,818	3,078	3,666	3,306	3,473
5	3,288	3,663	2,728	3,682	2,919	2,819	3,089	3,662	3,295	3,467
6	3,298	3,661	2,738	3,708	2,907	2,806	3,075	3,639	3,297	3,482
7	3,295	3,656	2,743	3,691	2,922	2,823	3,088	3,665	3,305	3,474
8	3,316	3,687	2,756	3,721	2,941	2,837	3,112	3,690	3,331	3,497
9	3,330	3,700	2,766	3,733	2,945		3,112	3,696	3,329	3,499
10	3,283	3,624	2,723	3,693	2,912	2,821	3,059	3,645	3,290	3,453
11	3,306	3,669	2,749	3,709	2,934	2,828	3,078	3,671	3,322	3,471
12	3,255	3,649	2,715	3,677	2,912	2,790	3,092	3,647	3,286	3,470
M	3,291	3,663	2,738	3,698	2,922	2,819	3,085	3,665	3,306	3,477
REF.	3,290	3,663	2,738	3,699	2,922	2,820	3,085	3,665	3,306	3,477
SD	0,022	0,019	0,014	0,020	0,012	0,013	0,016	0,017	0,015	0,014

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 12 laboratories using the reference method ISO 8968-1 | IDF 20-1, 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										
Outlier Grubbs										
sr	0,009	0,007	0,007	0,008	0,005	0,005	0,008	0,007	0,007	0,009
SR	0,023	0,020	0,015	0,021	0,013	0,013	0,017	0,017	0,016	0,015

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	- 0,035	- 0,015	- 0,010	- 0,036	+ 0,004	+ 0,007		+ 0,004	- 0,016	- 0,010	- 0,012	0,016	2,25
2	- 0,007	+ 0,010	- 0,003	- 0,007	- 0,002	- 0,005	- 0,013	- 0,002	+ 0,001	- 0,005	- 0,003	0,006	1,64
3	- 0,012	- 0,003	+ 0,005	+ 0,015	+ 0,001	+ 0,006	+ 0,000	+ 0,003	+ 0,006	+ 0,018	+ 0,004	0,008	1,42
4	+ 0,009	+ 0,002	- 0,002	+ 0,001	- 0,015	- 0,002	- 0,007	+ 0,001	+ 0,000	- 0,003	- 0,002	0,006	0,91
5	- 0,002	+ 0,000	- 0,010	- 0,016	- 0,003	- 0,001	+ 0,003	- 0,002	- 0,011	- 0,010	- 0,005	0,006	2,72
6	+ 0,007	- 0,002	- 0,000	+ 0,010	- 0,015	- 0,014	- 0,010	- 0,026	- 0,008	+ 0,005	- 0,005	0,011	1,52
7	+ 0,005	- 0,008	+ 0,005	- 0,008	- 0,000	+ 0,003	+ 0,003	+ 0,001	- 0,001	- 0,003	- 0,000	0,005	0,19
8	+ 0,026	+ 0,024	+ 0,018	+ 0,023	+ 0,018	+ 0,017	+ 0,026	+ 0,025	+ 0,025	+ 0,020	+ 0,022	0,004	19,86
9	+ 0,040	+ 0,037	+ 0,028	+ 0,034	+ 0,023		+ 0,027	+ 0,032	+ 0,023	+ 0,023	+ 0,029	0,006	13,78
10	- 0,007	- 0,039	- 0,015	- 0,006	- 0,011	+ 0,000	- 0,027	- 0,020	- 0,016	- 0,024	- 0,017	0,012	4,52
11	+ 0,015	+ 0,006	+ 0,011	+ 0,011	+ 0,012	+ 0,007	- 0,007	+ 0,007	+ 0,016	- 0,005	+ 0,007	0,008	2,96
12	- 0,035	- 0,014	- 0,023	- 0,022	- 0,010	- 0,031	+ 0,006	- 0,017	- 0,020	- 0,006	- 0,017	0,012	4,50
d	+ 0,000	- 0,000	+ 0,000	- 0,000	+ 0,000	- 0,001	- 0,000	+ 0,000	+ 0,000	- 0,000	- 0,000	0,016	
Sd	0,022	0,019	0,014	0,020	0,012	0,013	0,016	0,017	0,015	0,014	0,017		

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

Upper limits : $\bar{d}$ = +/- 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	-1,59	-0,76	-0,68	-1,81	+0,29	+0,57		+0,23	-1,02	-0,72
2	-0,31	+0,53	-0,20	-0,33	-0,16	-0,37	-0,83	-0,10	+0,07	-0,37
3	-0,53	-0,17	+0,38	+0,75	+0,05	+0,44	+0,00	+0,19	+0,37	+1,27
4	+0,40	+0,10	-0,14	+0,03	-1,23	-0,19	-0,46	+0,05	+0,01	-0,24
5	-0,10	+0,00	-0,72	-0,83	-0,23	-0,12	+0,20	-0,14	-0,70	-0,69
6	+0,33	-0,13	-0,02	+0,49	-1,24	-1,13	-0,65	-1,54	-0,54	+0,38
7	+0,22	-0,40	+0,38	-0,39	-0,00	+0,21	+0,16	+0,03	-0,05	-0,19
8	+1,16	+1,24	+1,26	+1,16	+1,48	+1,33	+1,63	+1,49	+1,65	+1,45
9	+1,80	+1,90	+1,96	+1,74	+1,81		+1,67	+1,90	+1,52	+1,61
10	-0,34	-2,04	-1,06	-0,31	-0,85	+0,00	-1,67	-1,19	-1,06	-1,72
11	+0,70	+0,31	+0,79	+0,54	+1,00	+0,59	-0,44	+0,40	+1,08	-0,37
12	-1,60	-0,74	-1,59	-1,11	-0,77	-2,44	+0,39	-1,05	-1,31	-0,45

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	-1,95	-0,81	-0,54	-1,99	+0,20	+0,40		+0,21	-0,87	-0,56
2	-0,38	+0,57	-0,16	-0,36	-0,11	-0,26	-0,74	-0,09	+0,06	-0,29
3	-0,65	-0,18	+0,30	+0,83	+0,03	+0,31	+0,00	+0,17	+0,31	+0,99
4	+0,48	+0,11	-0,11	+0,03	-0,85	-0,14	-0,41	+0,05	+0,01	-0,18
5	-0,12	+0,00	-0,57	-0,91	-0,16	-0,08	+0,18	-0,13	-0,59	-0,54
6	+0,40	-0,14	-0,02	+0,54	-0,86	-0,79	-0,58	-1,42	-0,46	+0,30
7	+0,27	-0,42	+0,30	-0,43	-0,00	+0,15	+0,14	+0,03	-0,04	-0,15
8	+1,42	+1,33	+0,99	+1,27	+1,03	+0,93	+1,45	+1,38	+1,39	+1,13
9	+2,20	+2,04	+1,54	+1,91	+1,26		+1,49	+1,75	+1,28	+1,25
10	-0,41	-2,19	-0,83	-0,34	-0,59	+0,00	-1,49	-1,10	-0,90	-1,34
11	+0,86	+0,34	+0,62	+0,60	+0,69	+0,41	-0,39	+0,37	+0,91	-0,29
12	-1,96	-0,79	-1,25	-1,22	-0,53	-1,71	+0,35	-0,96	-1,11	-0,35

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

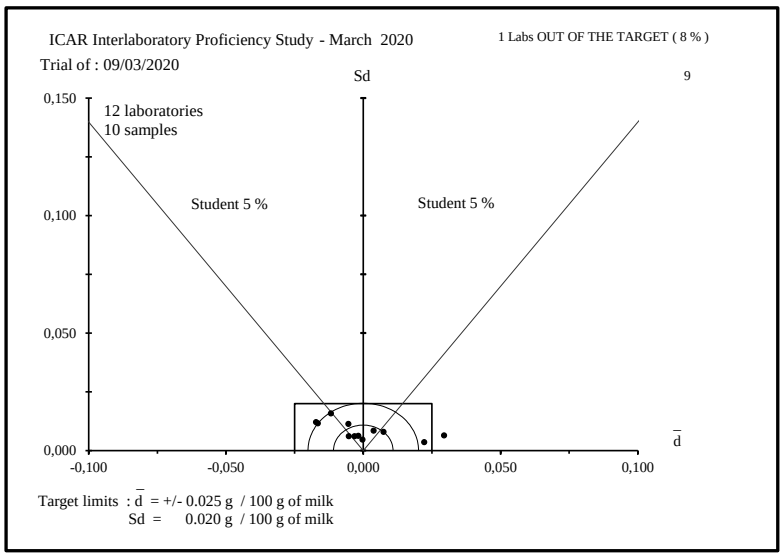


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

Table VIII : Relative recovery of nitrogen on pure solutions

N°	TRYP	GLY	SO4
1	104,6	94,8	69,4
2	99,9	99,9	98,9
3	99,5	99,9	99,1
4	97,6	98,8	99,0
5	99,5	99,7	98,6
6	99,3	100,6	101,0
7	99,8	100,6	99,3
8	100,5	100,5	99,6
9	100,7	100,4	99,6
10			
11	99,4	99,6	98,7
12	95,3	100,6	98,5

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 %

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
PROTEIN CONTENT KJELDAHL
March 2020

Name	City	Country
Actalia	Poligny	France
Agroscope Institute for food Sciences IFS	Bern-Liebefeld	Switzerland
Department Valorisation des productions Agricoles	Gembloux	Belgium
Eastern Lab services	Medina	USA
Estonian Livestock Performance Recording Ltd	Tartu	Estonie
Japan Dairy Technical Association	Tokyo	Japan
Laboratorio Standard Latte	Maccarese (Roma)	Italy
Lactanet	Quebec	Canada
Milchkontroll und Rinderzuchtverband eG	Güstrow	Germany
Milkom a.s Dairy research institute	Praha	Czech Republic
Qlip B.V.,	Zutphen	Netherlands
Univ. of Ljubljana dept. of Animal Sc. Inst. of Dairy Sc. and Probiotics	Domzale	Slovenia

ICAR

PROFICIENCY TESTING SCHEME

March 2020

Raw Milk

Determination of LACTOSE CONTENT

Sending date of statistical treatment : 8th April 2020

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

ACTALIA CECALAIT

cofrac COMPARAISONS INTERLABORATOIRES

ACCRÉDITATION N° 1-2473 PORTÉE DISPONIBLE SUR WWW.COFRAC.FR

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

Nb	%	N°	d	Sd	D	Method
1	11	8	- 0,005	0,019	0,020	Enzymatic-ISO 5765-2, IDF 79-2
2	22	6	+ 0,019	0,033	0,038	ISO 22662 / IDF 198
3	33	2	+ 0,040	0,008	0,040	ISO 22662 / IDF 198
4	44	3	+ 0,047	0,010	0,048	Gravimetric
5	56	4	+ 0,058	0,011	0,059	Tritration method
6	67	1	+ 0,059	0,008	0,060	Internal method
7	78	7	- 0,097	0,011	0,098	Enzymatic in house
8	89	9	- 0,163	0,032	0,166	ISO 22662 / IDF 198
9	100	5	+ 1,790	0,047	1,791	Continuous flow analysis

(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.(d^2 + Sd^2))

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 :

+/- 0.100 g / 100 g for $\bar{d}$ 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 8 laboratories , after outliers discarging 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}	0,013
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,079

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	0,010	0,010	0,005	0,014	0,011	0,011	0,006	0,016	0,004	0,009	0,007	20
2	0,036	0,007	0,006	0,006	0,016	0,007	0,001	0,014	0,002	0,016	0,010	20
3	0,003	0,000	0,015	0,017	0,004	0,010	0,004	0,017	0,021	0,013	0,009	20
4	0,026	0,030	0,021	0,008	0,018	0,003	0,007	0,001	0,014	0,004	0,012	20
5	0,130 *	0,020	0,000	0,040	0,070 *	0,070 *	0,020	0,040	0,090 *	0,010	0,044	20
6	0,001	0,013	0,017	0,025	0,002	0,000	0,001	0,001	0,002	0,001	0,007	20
7	0,026	0,022	0,012	0,015	0,008	0,017	0,006	0,018	0,003	0,005	0,011	20
8	0,026	0,003	0,017	0,020	0,015	0,020	0,025	0,010	0,015	0,021	0,013	20
9	0,014	0,019	0,042	0,035	0,017	0,007	0,056 *	0,062	0,054 *	0,103	0,035	20
Sr	0,034	0,012	0,013	0,016	0,019	0,018	0,015	0,019	0,026	0,025		180
NE	18	18	18	18	18	18	18	18	18	18		
L	0,050	0,040	0,045	0,055	0,030	0,026	0,028	0,065	0,026	0,027		

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

LACT *: The lactose solution was not taken into account for this statistical treatment of March 2020.

Sample / Lab code	11	12	13	14	15	16	17	18	19	20	LACT*
1	5,197	5,129	5,061	4,855	4,925	4,887	4,846	4,977	4,803	4,769	
2	5,160	5,118	5,038	4,848	4,899	4,874	4,828	4,956	4,785	4,746	
3	5,178	5,119	5,038	4,861	4,917	4,872	4,834	4,970	4,805	4,739	
4	5,189	5,136	5,038	4,884	4,934	4,894	4,820	4,983	4,796	4,760	
5	6,815 *	6,860 *	6,730 *	6,600 *	6,695 *	6,645 *	6,600 *	6,700 *	6,555 *	6,555 *	
6	5,174	5,117	4,955	4,818	4,891	4,865	4,825	4,961	4,692	4,755	
7	5,032	4,974	4,892	4,694	4,756	4,738	4,681	4,829	4,665	4,626	
8	5,104	5,057	5,015	4,808	4,885	4,807	4,767	4,921	4,758	4,691	
9	4,892	4,897	4,836	4,661	4,695	4,686	4,667	4,763	4,588	4,545	
M	5,116	5,068	4,984	4,803	4,863	4,828	4,783	4,920	4,736	4,704	
REF.	5,129	5,075	4,986	4,805	4,869	4,831	4,783	4,926	4,740	4,710	
SD	0,106	0,088	0,082	0,082	0,088	0,077	0,071	0,081	0,080	0,080	

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 8 laboratories, after outliers discarging using Grubbs test at 5 % risk level.

Table IV : Outlier identification

Sample	11	12	13	14	15	16	17	18	19	20
Outliers Cochran	5				5	5	9		5; 9	
Outlier Grubbs	5	5	5	5	5	5	5	5	5	5
sr	0,015	0,011	0,014	0,014	0,009	0,008	0,007	0,018	0,008	0,008
SR	0,106	0,088	0,082	0,083	0,088	0,078	0,058	0,082	0,057	0,051

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	+ 0,068	+ 0,054	+ 0,074	+ 0,050	+ 0,055	+ 0,056	+ 0,063	+ 0,051	+ 0,063	+ 0,058	+ 0,059	0,008	24,46
2	+ 0,031	+ 0,042	+ 0,052	+ 0,043	+ 0,030	+ 0,043	+ 0,044	+ 0,030	+ 0,045	+ 0,036	+ 0,040	0,008	16,46
3	+ 0,048	+ 0,044	+ 0,051	+ 0,056	+ 0,048	+ 0,041	+ 0,051	+ 0,043	+ 0,065	+ 0,028	+ 0,047	0,010	15,57
4	+ 0,060	+ 0,061	+ 0,051	+ 0,079	+ 0,065	+ 0,063	+ 0,036	+ 0,056	+ 0,056	+ 0,050	+ 0,058	0,011	16,22
5	+ 1,686	+ 1,785	+ 1,744	+ 1,795	+ 1,826	+ 1,814	+ 1,817	+ 1,774	+ 1,815	+ 1,845	+ 1,790	0,047	121,51
6	+ 0,044	+ 0,041	- 0,032	+ 0,013	+ 0,022	+ 0,034	+ 0,041	+ 0,034	- 0,048	+ 0,044	+ 0,019	0,033	1,86
7	- 0,097	- 0,101	- 0,094	- 0,111	- 0,113	- 0,093	- 0,102	- 0,097	- 0,075	- 0,085	- 0,097	0,011	27,21
8	- 0,025	- 0,019	+ 0,028	+ 0,003	+ 0,015	- 0,024	- 0,017	- 0,005	+ 0,018	- 0,020	- 0,005	0,019	0,74
9	- 0,237	- 0,179	- 0,150	- 0,144	- 0,175	- 0,145	- 0,116	- 0,163	- 0,152	- 0,166	- 0,163	0,032	16,22
d	- 0,014	- 0,007	- 0,003	- 0,001	- 0,007	- 0,003	+ 0,000	- 0,006	- 0,004	- 0,007	+ 0,194	0,572	
Sd	0,106	0,088	0,082	0,082	0,088	0,077	0,071	0,081	0,080	0,080	0,084		

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

Upper limits : $\bar{d}$ = +/- 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	+0,64	+0,61	+0,91	+0,62	+0,63	+0,72	+0,88	+0,63	+0,79	+0,73
2	+0,29	+0,48	+0,63	+0,53	+0,34	+0,55	+0,62	+0,37	+0,57	+0,45
3	+0,46	+0,50	+0,63	+0,68	+0,54	+0,53	+0,71	+0,54	+0,81	+0,35
4	+0,56	+0,69	+0,63	+0,97	+0,73	+0,81	+0,51	+0,70	+0,70	+0,62
5	+15,94	+20,30	+21,36	+21,88	+20,76	+23,42	+25,43	+22,01	+22,74	+23,11
6	+0,42	+0,47	-0,39	+0,16	+0,25	+0,44	+0,58	+0,43	-0,60	+0,55
7	-0,92	-1,15	-1,16	-1,35	-1,29	-1,20	-1,43	-1,21	-0,94	-1,06
8	-0,24	-0,21	+0,34	+0,04	+0,17	-0,30	-0,23	-0,06	+0,22	-0,25
9	-2,24	-2,03	-1,84	-1,76	-1,99	-1,87	-1,63	-2,02	-1,90	-2,08

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

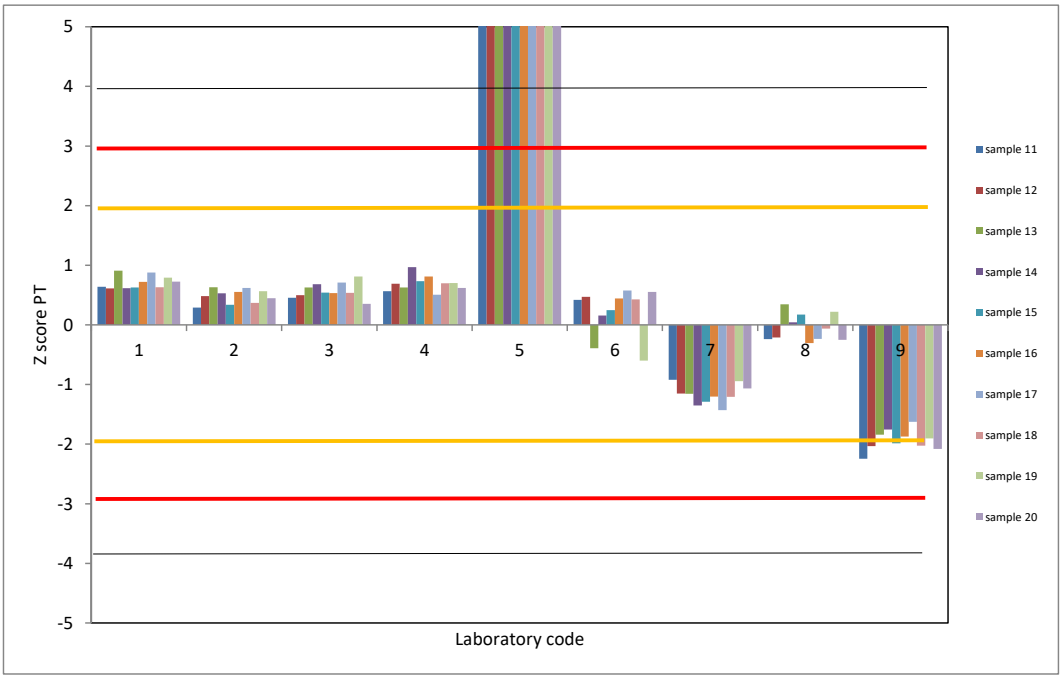


Table VII : Zscore of the different laboratories for each sample.
ZS calculated on the standard deviation of reproducibility of the method

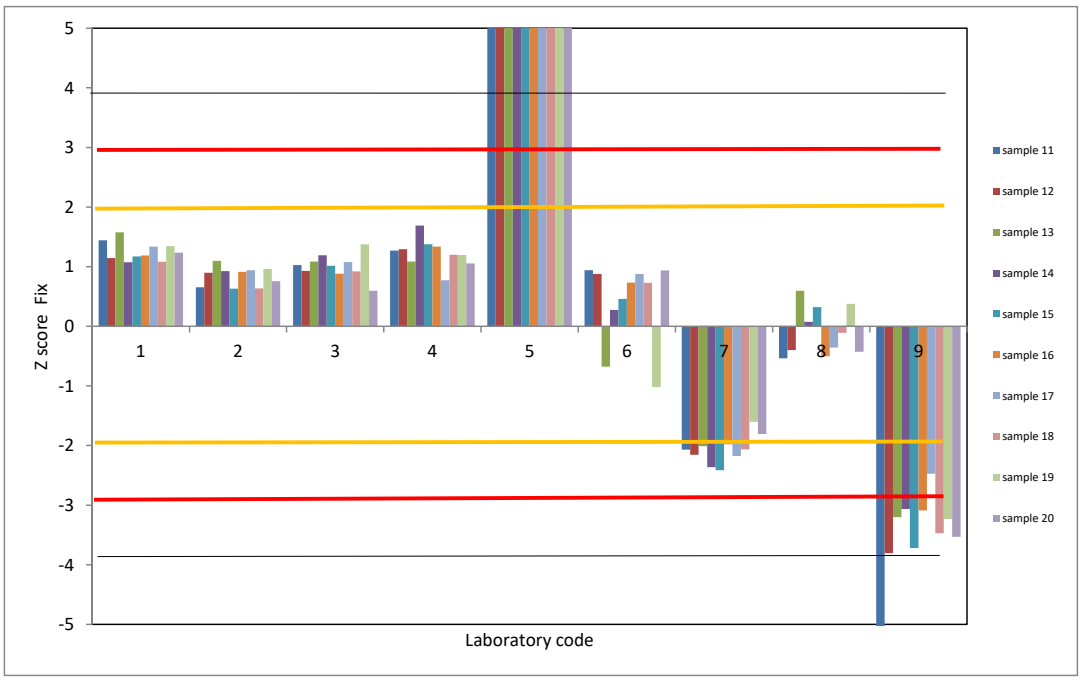
Sample / Lab code	11	12	13	14	15	16	17	18	19	20
1	+1,44	+1,14	+1,58	+1,07	+1,17	+1,19	+1,34	+1,08	+1,34	+1,23
2	+0,65	+0,90	+1,10	+0,93	+0,63	+0,91	+0,94	+0,64	+0,96	+0,76
3	+1,03	+0,93	+1,09	+1,19	+1,01	+0,88	+1,08	+0,92	+1,37	+0,60
4	+1,27	+1,29	+1,09	+1,69	+1,38	+1,34	+0,77	+1,20	+1,19	+1,05
5	+35,87	+37,97	+37,10	+38,20	+38,84	+38,60	+38,65	+37,74	+38,62	+39,25
6	+0,94	+0,88	-0,68	+0,28	+0,46	+0,73	+0,88	+0,73	-1,02	+0,94
7	-2,07	-2,15	-2,01	-2,36	-2,41	-1,98	-2,18	-2,07	-1,60	-1,81
8	-0,54	-0,40	+0,60	+0,07	+0,32	-0,50	-0,36	-0,11	+0,37	-0,43
9	-5,05	-3,80	-3,20	-3,06	-3,72	-3,09	-2,47	-3,47	-3,23	-3,53

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



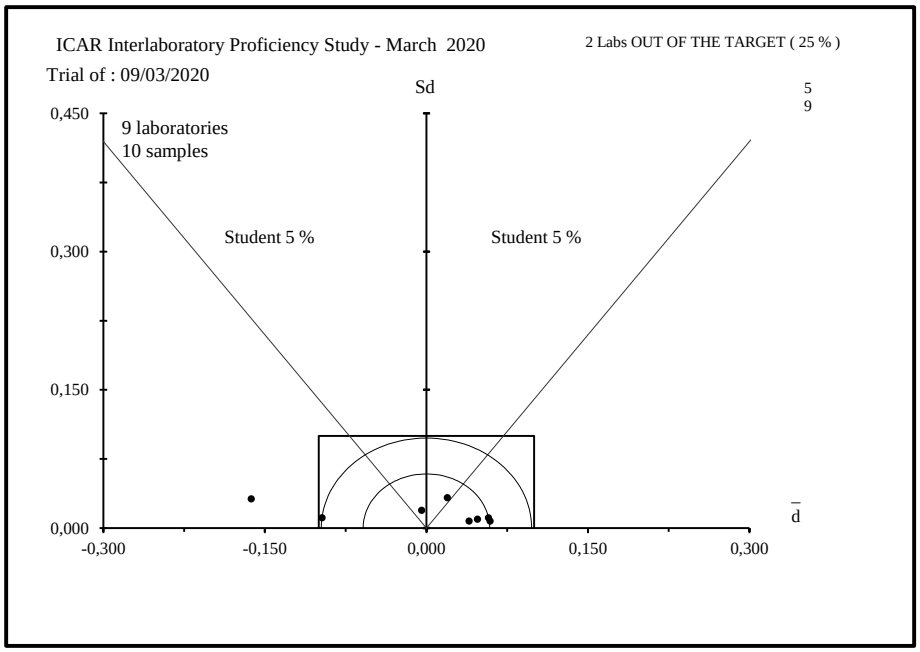


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST

RAW MILK
Lactose
March 2020

Name	City	Country
Agroscope Institute for food Sciences IFS	Bern-Liebefeld	Switzerland
Department Valorisation des productions Agricoles	Gembloux	Belgium
Estonian Livestock Performance Recording Ltd	Tartu	Estonie
Japan Dairy Technical Association	Tokyo	Japan
Lactanet	Quebec	Canada
Milchkontroll und Rinderzuchtverband eG	Güstrow	Germany
Milkom a.s Dairy research institute	Praha	Czech Republic
Qlip B.V.,	Zutphen	NL
Univ. of Ljubljana dept. of Animal Sc. Inst. of Dairy Sc. and Probiotics	Domzale	Slovenia

ICAR

PROFICIENCY TESTING SCHEME

March 2020

Raw Milk

Determination of UREA CONTENT

Sending date of statistical treatment : 8th April 2020

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

ACTALIA CECALAIT

cofrac COMPARAISONS INTERLABORATOIRES

ACCRÉDITATION N° 1-2473 PORTÉE DISPONIBLE SUR WWW.COFRAC.FR

Table I : Ranking of the laboratories Units : mg / dl

Nb	%	N°	d	Sd	D	Method
1	13	6	- 0,38	0,45	0,59	V 04-217
2	25	2	- 0,52	0,38	0,64	ISO 14637 / IDF 195
3	38	5	+ 0,20	1,18	1,19	ISO 14637 / IDF 195
4	50	3	- 1,66	0,54	1,74	ISO 14637 / IDF 195
5	63	7	+ 1,98	1,16	2,30	ISO 14637 / IDF 195
6	75	8	- 1,46	6,37	6,53	ISO 14637 / IDF 195
7	88	4	+ 5,97	2,81	6,60	continuous flow analysis
8	100	1	- 20,90	7,47	22,19	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 mg / dl for $\bar{d}$ and 1,50 mg / dl for Sd

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 6 laboratories using reference method (ISO 14637 | IDF 195 or V 04-217), after outlier discarging 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.(d^2 + Sd^2))

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}	0,33
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	2,06

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	0,100	0,100	0,000	0,100	0,100	0,000	0,000	0,05	20
2	0,570	0,330	0,000	0,180	0,510	0,000	0,060	0,240	0,710	0,890	0,32	20
3	0,180	0,090	0,160	0,560	0,120	0,650	0,250	0,220	0,100	0,620	0,26	20
4	0,133	0,160	0,045	0,129	0,133	0,192	0,181	0,103	0,171	0,115	0,10	20
5	0,500	0,900	0,500 *	0,000	1,100	0,700	0,600	0,700	0,000	0,700	0,47	20
6	0,400	0,100	0,200	0,100	0,300	0,300	0,200	0,200	0,300	0,400	0,19	20
7	0,210	2,750 *	2,000 *	0,610	0,840	0,010	0,860	1,160	0,460	0,140	0,87	20
8	0,610	0,770	1,200 *	1,150	0,160	0,650	0,140	0,320	0,380	38,540 *	8,63	20
Sr	0,27	0,75	0,60	0,36	0,38	0,30	0,28	0,36	0,25	9,64		160
NE	16	16	16	16	16	16	16	16	16	16		
L	0,90	1,06	0,24	1,19	1,26	1,00	0,93	1,20	0,82	1,16		

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	24,20 *	28,60 *	15,90 *	13,65 *	18,15 *	22,40 *	11,65 *	9,55 *	27,30 *	20,50 *
2	51,42	60,79	32,24	27,57	37,23	46,49	23,11	18,62	56,16	42,09
3	50,54	59,49	31,54	26,83	36,06	45,20	22,38	17,54	54,36	40,36
4	60,33 *	71,11 *	37,84	31,94	43,53 *	54,71 *	26,85	21,12	64,58	48,57
5	50,05	58,55	34,65	28,60	37,55	47,05	23,70	20,65	57,90	44,15
6	51,50	59,35	32,80	27,85	37,75	46,95	23,70	19,20	55,75	42,20
7	53,35	64,40	34,34	28,52	39,54	49,02	25,07	20,27	59,70	46,53
8	51,95	61,39	32,90	29,88	38,62	46,50	24,89	20,43	56,10	23,59 *
M	51,47	60,66	33,76	28,74	37,79	46,87	24,24	19,69	57,79	43,98
REF.	51,47	60,53	33,08	28,21	37,79	46,81	23,81	19,45	56,66	43,07
SD	1,15	2,10	2,11	1,70	1,19	1,24	1,49	1,28	3,44	3,08

M = mean per sample
SD = standard deviation per sample
REF. = reference values
*: 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 6 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		7	5; 7 8							8
Outlier Grubbs	1; 4	1; 4	1	1	1; 4	1; 4	1	1	1	1; 8
sr	0,31	0,39	0,09	0,38	0,44	0,34	0,30	0,39	0,27	0,39
SR	1,17	1,18	2,87	1,73	1,23	1,27	1,50	1,31	3,45	3,09

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	- 27,27	- 31,93	- 17,18	- 14,56	- 19,64	- 24,41	- 12,16	- 9,90	- 29,36	- 22,57	- 20,90	7,47	8,85
2	- 0,05	+ 0,25	- 0,84	- 0,64	- 0,57	- 0,32	- 0,70	- 0,83	- 0,51	- 0,98	- 0,52	0,38	4,29
3	- 0,93	- 1,05	- 1,54	- 1,38	- 1,73	- 1,62	- 1,43	- 1,91	- 2,30	- 2,71	- 1,66	0,54	9,70
4	+ 8,87	+ 10,58	+ 4,76	+ 3,73	+ 5,74	+ 7,89	+ 3,05	+ 1,67	+ 7,92	+ 5,51	+ 5,97	2,81	6,73
5	- 1,42	- 1,98	+ 1,57	+ 0,39	- 0,24	+ 0,24	- 0,11	+ 1,20	+ 1,24	+ 1,08	+ 0,20	1,18	0,53
6	+ 0,03	- 1,18	- 0,28	- 0,36	- 0,04	+ 0,14	- 0,11	- 0,25	- 0,91	- 0,87	- 0,38	0,45	2,69
7	+ 1,88	+ 3,86	+ 1,26	+ 0,31	+ 1,75	+ 2,20	+ 1,26	+ 0,82	+ 3,04	+ 3,47	+ 1,98	1,16	5,40
8	+ 0,48	+ 0,85	- 0,18	+ 1,67	+ 0,83	- 0,32	+ 1,08	+ 0,98	- 0,56	- 19,48	- 1,46	6,37	0,73
d	- 0,00	+ 0,12	+ 0,68	+ 0,53	+ 0,00	+ 0,05	+ 0,44	+ 0,24	+ 1,13	+ 0,92	- 2,10	8,29	
Sd	1,15	2,10	2,11	1,70	1,19	1,24	1,49	1,28	3,44	3,08	2,03		

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

Upper limits : $\bar{d}$ = +/- 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	-23,68	-15,21	-8,15	-8,54	-16,46	-19,63	-8,17	-7,73	-8,52	-7,32
2	-0,04	+0,12	-0,40	-0,37	-0,47	-0,26	-0,47	-0,65	-0,15	-0,32
3	-0,80	-0,50	-0,73	-0,81	-1,45	-1,30	-0,96	-1,49	-0,67	-0,88
4	+7,70	+5,04	+2,26	+2,19	+4,81	+6,35	+2,05	+1,30	+2,30	+1,79
5	-1,23	-0,94	+0,75	+0,23	-0,20	+0,19	-0,07	+0,94	+0,36	+0,35
6	+0,03	-0,56	-0,13	-0,21	-0,03	+0,11	-0,07	-0,20	-0,26	-0,28
7	+1,63	+1,84	+0,60	+0,18	+1,47	+1,77	+0,85	+0,64	+0,88	+1,12
8	+0,42	+0,41	-0,08	+0,98	+0,69	-0,26	+0,73	+0,76	-0,16	-6,32

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

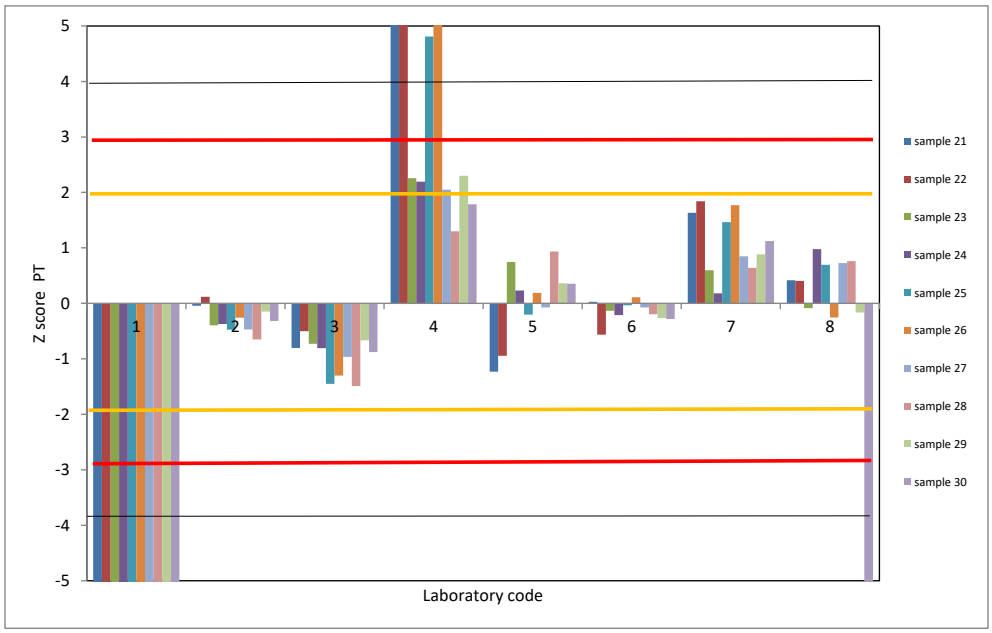


Table VII : Zscore of the different laboratories for each sample.
ZS calculated on the standard deviation of reproducibility of the method

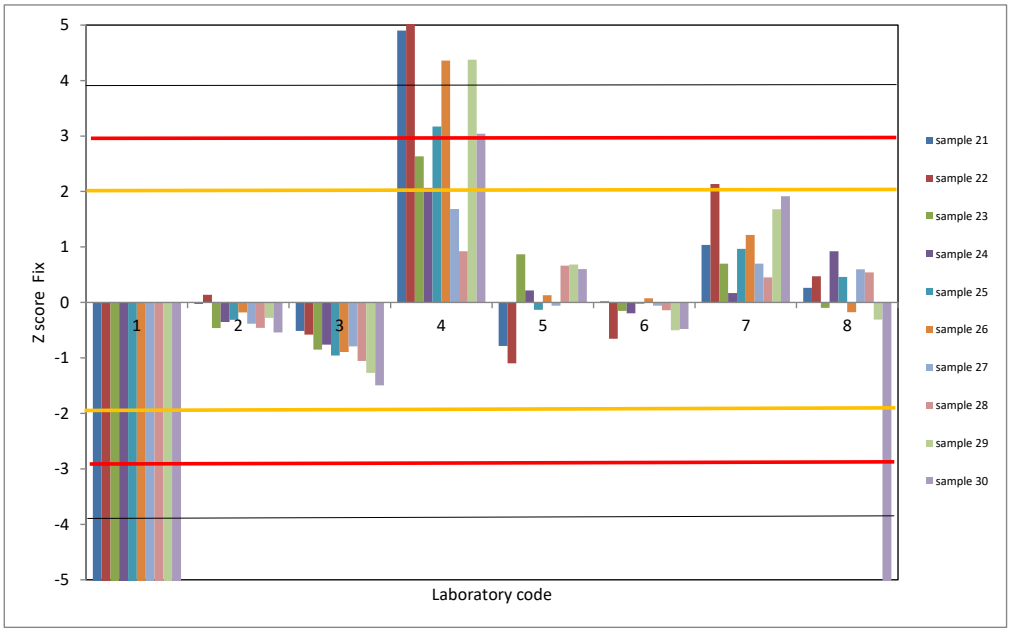
Sample / Lab Code	21	22	23	24	25	26	27	28	29	30
1	-15,06	-17,64	-9,49	-8,04	-10,85	-13,49	-6,72	-5,47	-16,22	-12,47
2	-0,03	+0,14	-0,46	-0,35	-0,31	-0,18	-0,39	-0,46	-0,28	-0,54
3	-0,51	-0,58	-0,85	-0,76	-0,96	-0,89	-0,79	-1,06	-1,27	-1,49
4	+4,90	+5,84	+2,63	+2,06	+3,17	+4,36	+1,68	+0,92	+4,37	+3,04
5	-0,78	-1,10	+0,87	+0,22	-0,13	+0,13	-0,06	+0,66	+0,68	+0,60
6	+0,02	-0,65	-0,15	-0,20	-0,02	+0,08	-0,06	-0,14	-0,50	-0,48
7	+1,04	+2,13	+0,70	+0,17	+0,97	+1,22	+0,70	+0,45	+1,68	+1,91
8	+0,26	+0,47	-0,10	+0,92	+0,46	-0,18	+0,60	+0,54	-0,31	-10,76

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



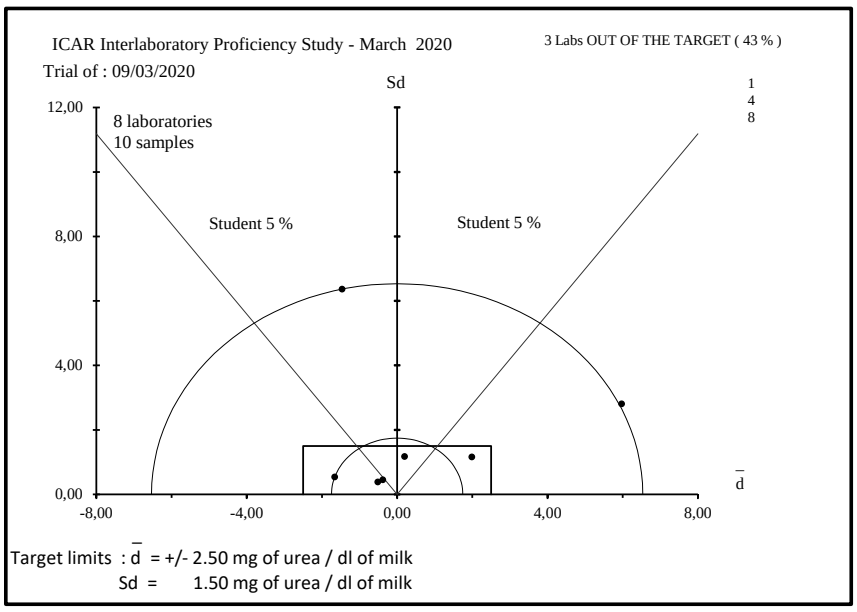


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST
RAW MILK
Urea
March 2020

Name	City	Country
Agroscope Institute for food Sciences IFS	Bern-Liebefeld	Switzerland
AIA-Laboratorio Standard Latte	Maccarese (RM)	Italy
Department Valorisation des productions Agricoles	Gembloux	Belgium
Eastern Lab services	Medina Ohio	USA
Estonian Livestock Performance Recording Ltd	Tartu	Estonie
Milchkontroll und Rinderzuchtverband eG	Güstrow	Germany
Qlip B.V.,	Zutphen	Netherlands
Univ. of Ljubljana dept. of Animal Sc. Inst. of Dairy Sc. and Probiotics	Domzale	Slovenia

ICAR

PROFICIENCY TESTING SCHEME

March 2020

Raw Milk

Enumeration of SOMATIC CELLS

Sending date of statistical treatment : 8th April 2020

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

ACTALIA CECALAIT

cofrac COMPARAISONS INTERLABORATOIRES

ACCRÉDITATION N° 1-2473 PORTÉE DISPONIBLE SUR WWW.COFRAC.FR

Table I : Ranking of the laboratories in %

Nb	%	N°	d	Sd	D	Method
1	3	14	- 0%	1%	1%	B
2	5	37	- 1%	2%	2%	B
3	8	35	- 1%	2%	2%	B
4	10	4	+ 1%	2%	2%	B
5	13	16	+ 1%	2%	2%	B
6	15	39	- 1%	3%	3%	B
7	18	13	+ 2%	3%	3%	B
8	21	30	- 1%	4%	4%	B
9	23	29	- 1%	4%	4%	B
10	26	17	- 3%	4%	5%	B
11	28	36	- 4%	3%	5%	B
12	31	15	- 3%	4%	5%	B
13	33	7	- 2%	5%	5%	B
14	36	18	+ 4%	4%	5%	B
15	38	6	- 3%	4%	5%	B
16	41	38	+ 4%	4%	6%	B
17	44	9	+ 4%	4%	6%	B
18	46	10	- 4%	4%	6%	B
19	49	5	+ 5%	4%	6%	B
20	51	26	- 2%	7%	7%	C
21	54	2	+ 8%	6%	10%	B
22	56	23	+ 9%	7%	11%	B
23	59	27	- 8%	8%	11%	B
24	62	1	- 2%	11%	12%	A
25	64	34	- 10%	7%	12%	B
26	67	28	- 9%	9%	13%	B
27	69	3	+ 12%	8%	14%	B
28	72	25	- 12%	8%	15%	B
29	74	8	- 13%	9%	16%	B
30	77	11	+ 12%	10%	16%	B
31	79	31	+ 13%	11%	17%	B
32	82	24	- 15%	13%	20%	B
33	85	19	+ 16%	14%	21%	B
34	87	12	+ 20%	18%	27%	B
35	90	33	- 23%	17%	28%	B
36	92	20	+ 22%	21%	30%	B
37	95	32	- 28%	21%	35%	B
38	97	22	+ 65%	142%	156%	B
39	100	21	+ 68%	144%	159%	B

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 :

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 38 laboratories using reference metod ISO 13366-1|IDF 148-1 and alternative method ISO 13366-2|IDF 148-2 after outlier discarging using Grubbs test at 5% risk level

A ISO 13366-1|IDF 148-1

B ISO 13366-2|IDF 148-2

C Image Cytometry

(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.(d^2 + Sd^2))

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}	12	3%
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	60	14%

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	1	4	5	4	0	27	4	9	0	5	7	20
2	13	7	4	17	15	22	15	3	4	1	9	20
3	2	11	16	4	8	81	12	17	2	4	19	20
4	1	2	1	1	1	9	9	4	1	5	3	20
5	20	20	17	9	15	29	2	2	3	2	11	20
6	9	14	4	13	7	6	39	17	4	2	11	20
7	16	17	13	0	12	4	0	11	1	0	7	20
8	12	5	5	3	2	13	35	3	2	1	9	20
9	6	20	2	14	6	23	33	18	2	11	12	20
10	4	4	6	17	2	6	6	7	2	2	5	20
11	26	26	1	12	0	1	2	32	5	4	11	20
12	10	2	0	8	2	21	6	2	0	2	6	20
13	12	21	0	3	9	15	11	23	4	3	9	20
14	46	121 *	7	1	12	55	16	11	8	5	32	20
15	36	8	14	9	11	36	5	3	9	7	13	20
16	19	22	2	12	0	1	14	9	3	0	8	20
17	127 *	32	37	39	27	61	63 *	70	11	10	41	20
18	157 *	104 *	71 *	78 *	29	187 *	106 *	79	21 *	21 *	71	20
19	2	41	2	17	13	21	2	18	1	0	12	20
20	67 *	20	2	2	14	91	12	52	0	4	28	20
21	15	3	27	37	25	3	15	77	3	11	22	20
22	14	2	68 *	15	10	2	7	18	16 *	75 *	24	20
23	2	13	0	4	16	32	1	7	8	2	9	20
24	7	7	8	3	9	4	22	8	6	5	7	20
25	6	11	3	5	9	21	4	0	5	1	6	20
26	30	25	42	15	9	25	47	135 *	4	5	35	20
27	22	42	1	10	7	9	33	18	2	8	14	20
28	0	2	2	19	8	11	3	15	4	3	6	20
29	33	4	24	30	5	64	14	7	2	2	19	20
30	27	84 *	18	7	10	35	5	28	5	4	23	20
31	19	15	5	0	5	20	4	8	1	1	7	20
32	14	10	16	20	2	2	7	45	4	3	12	20
33	12	31	10	2	6	3	0	7	4	10	8	20
34	15	2	29	11	2	38	2	9	4	6	12	20
35	4	15	16	11	4	4	6	5	6	2	6	20
36	5	67 *	7	16	10	13	11	3	1	2	16	20
37	9	13	5	4	4	10	19	17	5	2	7	20
38	19	8	10	10	6	32	10	32	2	6	12	20
39	3	25	6	5	10	9	7	22	3	3	8	20
Sr	27	25	15	13	8	31	18	25	4	9		780
r	126	126	42	50	25	126	63	50	25	25		
NE	78	78	78	78	78	78	78	78	78	78		
L	53	55	44	43	34	96	51	84	13	15		

Sr : repeatability standard deviation of each laboratory limit : Cf 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 r

Sample / Lab code	31	32	33
1	781	874	225
2	823	965	218
3	833	984	235
4	761	901	211
5	805	938	206
6	747	861	202
7	735	847	202
8	675	792	179
9	764	921	208
10	729	855	188
11	842	1004	230
12	924	1082	234
13	760	903	198
14	760	915	202
15	751	857	208
16	775	911	201
17	743	870	213
18	794	880	225
19	883	1039	234
20	1026 *	1127	265
21	212 *	1109	1088 *
22	187 *	1045	1062 *
23	811	974	227
24	662	799	171
25	689	815	175
26	776	838	215
27	658	865	191
28	758	803	183
29	773	853	207
30	794	865	202
31	861	1034	234
32	551	679	146
33	577	722	164
34	707	848	190
35	753	886	198
36	732	865	193
37	768	889	200
38	805	917	212
39	734	875	210
M	758	903	205
REF.	761	902	205
SD	74	97	23

M = mean per sample

SD = standard deviation per sample

REF : Assigned values are robust av
of 38 laboratories using the referen

after outlier discarging using Grubbs

Table IV : Outlier identifica

Sample	31	32	33
Outliers Cochran	17;18 20	14;18 30;36	18;22
Outlier Grubbs	20;21 22		21;22
sr	12	13	10
SR	77	103	24
sr %	2%	1%	5%
SR %	10%	11%	12%

ICAR Proficiency Test March 2020

eplicates in 10^3 cells / ml

34	35	36	37	38	39	40
316	144	1036	379	386	37	57
327	141	1056	570	427	44	74
345	157	1107	586	436	50	80
311	145	1015	531	398	42	62
330	138	1027	553	409	39	68
310	128	946	495	376	39	64
307	144	975	511	379	51	77
261	116	880	452	333	34	53
323	135	1060	540	415	44	72
292	127	954	508	365	41	64
343	143	1118	605	436	40	71
361	158	1218	626	465	41	73
319	143	1029	539	400	41	75
297	135	996	517	382	38	65
279	123	973	493	379	40	65
316	130	1006	540	378	43	65
303	138	951	501	386	41	62
334	147	1009	548	419	45	70
355	155	1157	626	441	40	69
351	175	1124	635	461	39	60
1273 *	285 *	427 *	180 *	1448 *	722 *	526 *
1259 *	266 *	435 *	187 *	1409 *	728 *	534 *
335	141	1083	575	426	46	63
250	116	809	450	323	32	53
250	117	876	449	324	32	52
316	131	930	517	373	42	74
302	129	934	455	348	33	58
275	124	879	463	335	34	57
293	127	995	518	387	37	63
301	129	986	516	386	32	60
354	145	1123	585	432	45	76
215	95	736	361	246	25	49
229	101	789	395	291	29	45
276	114	898	454	333	34	46
306	133	988	525	371	42	65
302	129	975	492	368	39	65
299	131	1000	508	391	38	67
326	140	1036	552	402	40	64
310	141	995	513	395	37	65
306	134	991	516	384	39	64
308	134	996	518	386	39	64
34	15	101	65	46	5	9

REF. = reference values

*: discarded data using the test of Grubbs 5 %

erage values per sample according to algorithm A of standard ISO 13528,
ce method ISO 13366 | IDF 148-1 and alternative method ISO 13366-2 | IDF 148-2,

test at 5% risk level

tion

34	35	36	37	38	39	40
18		18	18	26	18;22	18;22
21;22	21;22	21;22	21;22	21;22	21;22	21;22
9	7	23	12	18	3	3
35	16	104	67	48	6	9
3%	6%	2%	2%	5%	8%	5%
11%	12%	10%	13%	13%	15%	14%

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	+ 3%	- 3%	+ 9%	+ 3%	+ 7%	+ 4%	- 27%	- 0%	- 5%	- 11%	- 2%	11%	0,51
2	+ 8%	+ 7%	+ 6%	+ 6%	+ 5%	+ 6%	+ 10%	+ 10%	+ 13%	+ 15%	+ 8%	6%	4,22
3	+ 10%	+ 9%	+ 14%	+ 12%	+ 17%	+ 11%	+ 13%	+ 13%	+ 29%	+ 25%	+ 12%	8%	4,87
4	- 0%	- 0%	+ 3%	+ 1%	+ 8%	+ 2%	+ 2%	+ 3%	+ 7%	- 4%	+ 1%	2%	2,76
5	+ 6%	+ 4%	+ 0%	+ 7%	+ 2%	+ 3%	+ 7%	+ 6%	- 1%	+ 7%	+ 5%	4%	3,74
6	- 2%	- 5%	- 2%	+ 1%	- 5%	- 5%	- 5%	- 3%	+ 0%	+ 0%	- 3%	4%	2,57
7	- 3%	- 6%	- 2%	- 0%	+ 7%	- 2%	- 1%	- 2%	+ 30%	+ 21%	- 2%	5%	1,30
8	- 11%	- 12%	- 13%	- 15%	- 14%	- 12%	- 13%	- 14%	- 12%	- 18%	- 13%	9%	4,25
9	+ 0%	+ 2%	+ 1%	+ 5%	+ 1%	+ 6%	+ 4%	+ 7%	+ 13%	+ 12%	+ 4%	4%	2,81
10	- 4%	- 5%	- 8%	- 5%	- 5%	- 4%	- 2%	- 6%	+ 6%	+ 0%	- 4%	4%	3,59
11	+ 11%	+ 11%	+ 12%	+ 11%	+ 7%	+ 12%	+ 17%	+ 13%	+ 2%	+ 11%	+ 12%	10%	3,77
12	+ 21%	+ 20%	+ 14%	+ 17%	+ 17%	+ 22%	+ 21%	+ 20%	+ 5%	+ 14%	+ 20%	18%	3,52
13	- 0%	+ 0%	- 4%	+ 4%	+ 6%	+ 3%	+ 4%	+ 3%	+ 6%	+ 17%	+ 2%	3%	2,50
14	- 0%	+ 1%	- 2%	- 4%	+ 1%	- 0%	- 0%	- 1%	- 2%	+ 1%	- 0%	1%	0,47
15	- 1%	- 5%	+ 1%	- 9%	- 9%	- 2%	- 5%	- 2%	+ 2%	+ 1%	- 3%	4%	3,00
16	+ 2%	+ 1%	- 2%	+ 3%	- 3%	+ 1%	+ 4%	- 2%	+ 10%	+ 2%	+ 1%	2%	1,70
17	- 2%	- 4%	+ 4%	- 2%	+ 2%	- 5%	- 3%	- 0%	+ 4%	- 3%	- 3%	4%	1,99
18	+ 4%	- 2%	+ 9%	+ 9%	+ 9%	+ 1%	+ 6%	+ 8%	+ 15%	+ 9%	+ 4%	4%	2,90
19	+ 16%	+ 15%	+ 14%	+ 15%	+ 15%	+ 16%	+ 21%	+ 14%	+ 2%	+ 8%	+ 16%	14%	3,70
20	+ 35%	+ 25%	+ 29%	+ 14%	+ 30%	+ 13%	+ 23%	+ 19%	+ 0%	- 6%	+ 22%	21%	3,33
21	- 72%	+ 23%	+ 430%	+ 314%	+ 112%	- 57%	- 65%	+ 275%	+ 1759%	+ 724%	+ 68%	144%	1,51
22	- 75%	+ 16%	+ 417%	+ 309%	+ 98%	- 56%	- 64%	+ 265%	+ 1776%	+ 737%	+ 65%	142%	1,44
23	+ 7%	+ 8%	+ 11%	+ 9%	+ 5%	+ 9%	+ 11%	+ 10%	+ 19%	- 1%	+ 9%	7%	3,94
24	- 13%	- 11%	- 17%	- 19%	- 14%	- 19%	- 13%	- 16%	- 18%	- 18%	- 15%	13%	3,76
25	- 9%	- 10%	- 15%	- 19%	- 13%	- 12%	- 13%	- 16%	- 19%	- 19%	- 12%	8%	4,66
26	+ 2%	- 7%	+ 5%	+ 3%	- 3%	- 7%	- 0%	- 4%	+ 8%	+ 15%	- 2%	7%	1,09
27	- 13%	- 4%	- 7%	- 2%	- 4%	- 6%	- 12%	- 10%	- 15%	- 9%	- 8%	8%	3,24
28	- 0%	- 11%	- 11%	- 11%	- 8%	- 12%	- 11%	- 13%	- 12%	- 11%	- 9%	9%	3,15
29	+ 2%	- 5%	+ 1%	- 5%	- 6%	- 0%	+ 0%	+ 0%	- 5%	- 1%	- 1%	4%	1,17
30	+ 4%	- 4%	- 2%	- 2%	- 4%	- 1%	- 0%	- 0%	- 19%	- 6%	- 1%	4%	0,83
31	+ 13%	+ 15%	+ 14%	+ 15%	+ 8%	+ 13%	+ 13%	+ 12%	+ 15%	+ 18%	+ 13%	11%	3,82
32	- 28%	- 25%	- 29%	- 30%	- 29%	- 26%	- 30%	- 36%	- 36%	- 24%	- 28%	21%	4,24
33	- 24%	- 20%	- 20%	- 26%	- 25%	- 21%	- 24%	- 25%	- 25%	- 29%	- 23%	17%	4,18
34	- 7%	- 6%	- 8%	- 10%	- 15%	- 10%	- 12%	- 14%	- 12%	- 28%	- 10%	7%	4,61
35	- 1%	- 2%	- 4%	- 1%	- 1%	- 1%	+ 1%	- 4%	+ 8%	+ 2%	- 1%	2%	1,92
36	- 4%	- 4%	- 6%	- 2%	- 4%	- 2%	- 5%	- 5%	- 1%	+ 2%	- 4%	3%	3,75
37	+ 1%	- 2%	- 3%	- 3%	- 2%	+ 0%	- 2%	+ 1%	- 3%	+ 5%	- 1%	2%	1,11
38	+ 6%	+ 2%	+ 3%	+ 6%	+ 4%	+ 4%	+ 7%	+ 4%	+ 3%	+ 0%	+ 4%	4%	3,58
39	- 4%	- 3%	+ 2%	+ 1%	+ 5%	- 0%	- 1%	+ 2%	- 6%	+ 1%	- 1%	3%	1,00
d	- 0%	+ 0%	+ 0%	- 1%	- 0%	- 1%	- 0%	- 1%	+ 0%	+ 0%	- 17%	143%	
Sd	10%	11%	11%	11%	12%	10%	13%	12%	14%	13%			

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

Upper limits : $\bar{d}$ = +/- 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	+0,27	-0,29	+0,84	+0,24	+0,63	+0,39	-2,14	-0,01	-0,33	-0,85
2	+0,83	+0,64	+0,56	+0,55	+0,40	+0,59	+0,80	+0,88	+0,96	+1,13
3	+0,97	+0,84	+1,30	+1,09	+1,47	+1,09	+1,05	+1,07	+2,07	+1,89
4	-0,00	-0,01	+0,23	+0,08	+0,66	+0,18	+0,19	+0,26	+0,50	-0,26
5	+0,60	+0,37	+0,01	+0,64	+0,21	+0,30	+0,54	+0,50	-0,06	+0,49
6	-0,19	-0,42	-0,14	+0,05	-0,44	-0,50	-0,36	-0,23	+0,04	+0,03
7	-0,34	-0,57	-0,16	-0,02	+0,63	-0,21	-0,11	-0,17	+2,16	+1,54
8	-1,15	-1,14	-1,17	-1,38	-1,18	-1,15	-1,02	-1,17	-0,89	-1,31
9	+0,04	+0,19	+0,12	+0,45	+0,05	+0,63	+0,33	+0,63	+0,96	+0,90
10	-0,43	-0,49	-0,75	-0,47	-0,47	-0,42	-0,15	-0,47	+0,41	+0,03
11	+1,09	+1,05	+1,06	+1,03	+0,56	+1,20	+1,34	+1,08	+0,13	+0,84
12	+2,19	+1,85	+1,27	+1,55	+1,51	+2,19	+1,68	+1,72	+0,37	+1,05
13	-0,01	+0,00	-0,32	+0,31	+0,53	+0,32	+0,32	+0,29	+0,41	+1,25
14	-0,01	+0,13	-0,16	-0,33	+0,05	-0,01	-0,01	-0,10	-0,15	+0,09
15	-0,13	-0,46	+0,12	-0,85	-0,76	-0,23	-0,39	-0,17	+0,13	+0,09
16	+0,19	+0,09	-0,19	+0,24	-0,28	+0,09	+0,34	-0,19	+0,68	+0,14
17	-0,24	-0,33	+0,32	-0,15	+0,21	-0,45	-0,27	-0,00	+0,31	-0,21
18	+0,44	-0,23	+0,84	+0,77	+0,79	+0,12	+0,46	+0,70	+1,05	+0,67
19	+1,64	+1,40	+1,26	+1,37	+1,31	+1,59	+1,67	+1,19	+0,13	+0,61
20	+3,56	+2,31	+2,61	+1,26	+2,64	+1,26	+1,81	+1,63	+0,04	-0,44
21	-7,38	+2,12	+38,58	+28,15	+9,72	-5,64	-5,22	+23,08	+126,39	+53,80
22	-7,70	+1,47	+37,46	+27,74	+8,52	-5,55	-5,12	+22,25	+127,59	+54,73
23	+0,68	+0,73	+0,95	+0,80	+0,44	+0,86	+0,87	+0,86	+1,33	-0,09
24	-1,33	-1,07	-1,50	-1,70	-1,21	-1,85	-1,05	-1,37	-1,26	-1,31
25	-0,96	-0,90	-1,34	-1,70	-1,15	-1,19	-1,06	-1,35	-1,35	-1,43
26	+0,21	-0,67	+0,43	+0,23	-0,24	-0,66	-0,02	-0,30	+0,59	+1,13
27	-1,38	-0,38	-0,65	-0,17	-0,37	-0,62	-0,98	-0,83	-1,07	-0,67
28	-0,04	-1,02	-0,97	-0,97	-0,66	-1,16	-0,86	-1,12	-0,89	-0,85
29	+0,16	-0,51	+0,08	-0,43	-0,50	-0,01	+0,00	+0,01	-0,33	-0,09
30	+0,44	-0,38	-0,14	-0,21	-0,34	-0,10	-0,04	-0,00	-1,35	-0,44
31	+1,34	+1,35	+1,24	+1,35	+0,66	+1,26	+1,04	+1,00	+1,05	+1,37
32	-2,82	-2,30	-2,59	-2,71	-2,54	-2,57	-2,43	-3,06	-2,56	-1,78
33	-2,47	-1,86	-1,80	-2,30	-2,15	-2,05	-1,90	-2,08	-1,82	-2,19
34	-0,73	-0,56	-0,69	-0,94	-1,31	-0,97	-0,99	-1,17	-0,89	-2,07
35	-0,10	-0,17	-0,32	-0,06	-0,08	-0,08	+0,11	-0,34	+0,59	+0,14
36	-0,39	-0,39	-0,56	-0,17	-0,34	-0,21	-0,41	-0,41	-0,06	+0,14
37	+0,09	-0,14	-0,25	-0,25	-0,21	+0,04	-0,16	+0,09	-0,24	+0,38
38	+0,59	+0,15	+0,30	+0,53	+0,37	+0,40	+0,53	+0,34	+0,22	+0,03
39	-0,36	-0,28	+0,21	+0,05	+0,44	-0,02	-0,08	+0,19	-0,43	+0,09

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

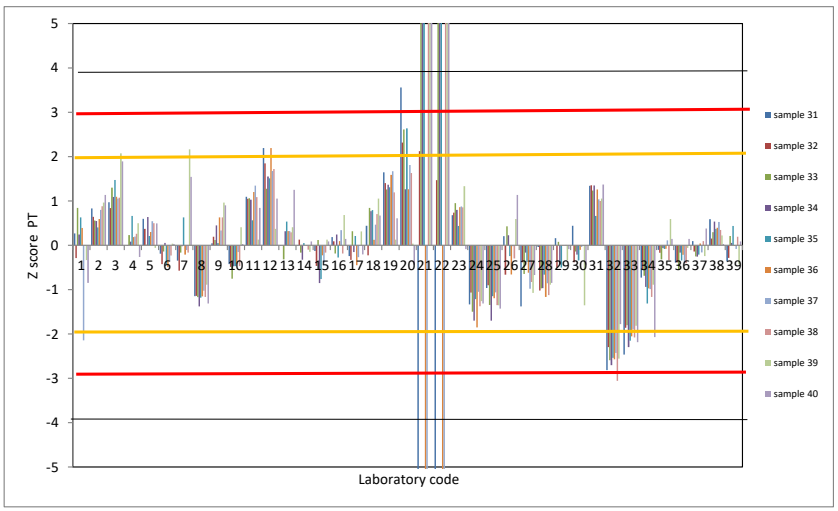


Table VII : Zscore of the different laboratories for each sample.

ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	31	32	33	34	35	36	37	38	39	40
1	+0,43	-0,52	+1,04	+0,34	+0,81	+0,66	-3,83	-0,02	-0,52	-1,27
2	+1,35	+1,15	+0,69	+0,76	+0,52	+1,00	+1,42	+1,31	+1,49	+1,70
3	+1,58	+1,50	+1,61	+1,51	+1,88	+1,85	+1,88	+1,60	+3,21	+2,83
4	-0,00	-0,02	+0,28	+0,11	+0,85	+0,31	+0,35	+0,38	+0,77	-0,39
5	+0,97	+0,66	+0,01	+0,89	+0,27	+0,51	+0,97	+0,74	-0,09	+0,74
6	-0,31	-0,76	-0,18	+0,07	-0,56	-0,84	-0,65	-0,34	+0,06	+0,04
7	-0,56	-1,03	-0,20	-0,03	+0,81	-0,35	-0,19	-0,25	+3,35	+2,31
8	-1,88	-2,04	-1,45	-1,92	-1,51	-1,95	-1,83	-1,74	-1,38	-1,96
9	+0,07	+0,35	+0,15	+0,62	+0,06	+1,06	+0,60	+0,93	+1,49	+1,35
10	-0,69	-0,87	-0,93	-0,66	-0,60	-0,70	-0,27	-0,70	+0,63	+0,04
11	+1,78	+1,88	+1,31	+1,43	+0,72	+2,03	+2,40	+1,61	+0,20	+1,26
12	+3,58	+3,32	+1,58	+2,16	+1,93	+3,71	+2,99	+2,56	+0,57	+1,57
13	-0,01	+0,01	-0,39	+0,44	+0,68	+0,54	+0,57	+0,43	+0,63	+1,87
14	-0,01	+0,23	-0,20	-0,46	+0,06	-0,01	-0,02	-0,15	-0,23	+0,13
15	-0,21	-0,83	+0,15	-1,19	-0,97	-0,39	-0,70	-0,25	+0,20	+0,13
16	+0,30	+0,16	-0,23	+0,34	-0,35	+0,16	+0,61	-0,28	+1,06	+0,22
17	-0,40	-0,59	+0,39	-0,21	+0,27	-0,76	-0,48	-0,00	+0,48	-0,31
18	+0,72	-0,41	+1,04	+1,07	+1,01	+0,21	+0,83	+1,05	+1,63	+1,00
19	+2,68	+2,52	+1,56	+1,90	+1,67	+2,68	+2,98	+1,78	+0,20	+0,91
20	+5,80	+4,15	+3,23	+1,76	+3,37	+2,13	+3,23	+2,42	+0,06	-0,66
21	-12,03	+3,81	+47,76	+39,19	+12,43	-9,53	-9,33	+34,36	+195,47	+80,46
22	-12,57	+2,64	+46,38	+38,62	+10,90	-9,39	-9,14	+33,11	+197,33	+81,85
23	+1,10	+1,32	+1,18	+1,11	+0,56	+1,45	+1,56	+1,27	+2,06	-0,13
24	-2,17	-1,91	-1,85	-2,36	-1,55	-3,13	-1,87	-2,04	-1,95	-1,96
25	-1,57	-1,62	-1,66	-2,36	-1,47	-2,02	-1,90	-2,01	-2,09	-2,14
26	+0,34	-1,19	+0,53	+0,32	-0,31	-1,11	-0,04	-0,44	+0,91	+1,70
27	-2,25	-0,69	-0,80	-0,23	-0,48	-1,05	-1,75	-1,23	-1,66	-1,00
28	-0,06	-1,83	-1,20	-1,35	-0,85	-1,97	-1,53	-1,67	-1,38	-1,27
29	+0,26	-0,91	+0,09	-0,60	-0,64	-0,02	+0,00	+0,01	-0,52	-0,13
30	+0,72	-0,69	-0,18	-0,29	-0,44	-0,18	-0,07	-0,00	-2,09	-0,66
31	+2,19	+2,43	+1,53	+1,88	+0,85	+2,12	+1,85	+1,48	+1,63	+2,04
32	-4,59	-4,12	-3,21	-3,77	-3,25	-4,35	-4,34	-4,55	-3,95	-2,66
33	-4,02	-3,34	-2,23	-3,20	-2,75	-3,47	-3,39	-3,10	-2,81	-3,27
34	-1,19	-1,00	-0,85	-1,31	-1,68	-1,64	-1,76	-1,74	-1,38	-3,10
35	-0,17	-0,31	-0,39	-0,09	-0,10	-0,14	+0,20	-0,51	+0,91	+0,22
36	-0,64	-0,70	-0,69	-0,23	-0,44	-0,36	-0,73	-0,60	-0,09	+0,22
37	+0,15	-0,25	-0,31	-0,35	-0,27	+0,07	-0,29	+0,14	-0,37	+0,56
38	+0,96	+0,27	+0,37	+0,74	+0,47	+0,67	+0,94	+0,51	+0,34	+0,04
39	-0,60	-0,51	+0,26	+0,07	+0,56	-0,03	-0,15	+0,29	-0,66	+0,13

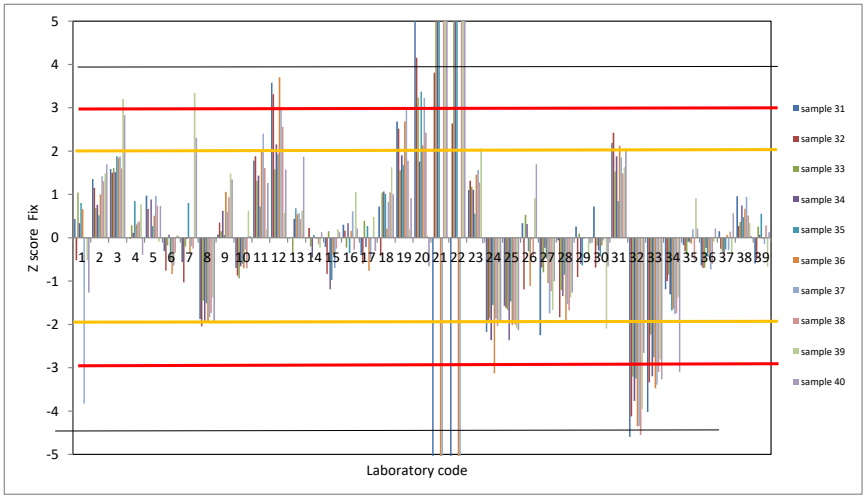
This table will allows to compare your ZSCORE from one PT to an other because the standard deviation has always the value of SR of the method SR : Cf page 5./8

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



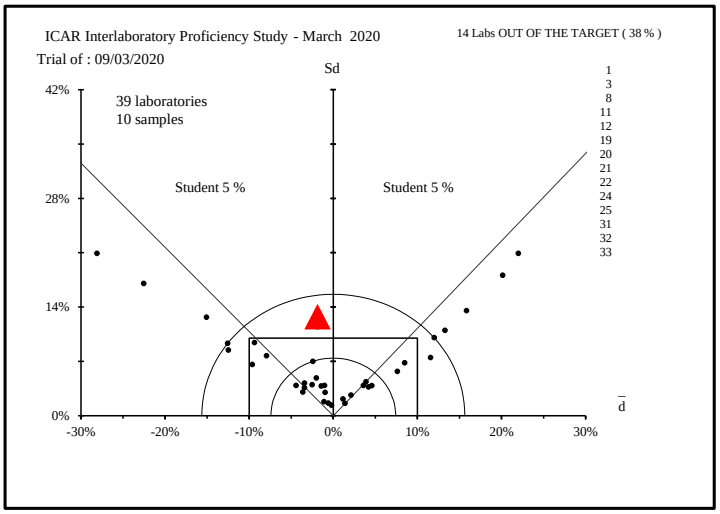


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

▲ Microscope metod ISO 13366-1/IDF 148-1

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST

RAW MILK

SOMATIC CELL CONTENT

March 2020

Name	City	Country
Actalia	Poligny	France
Agroscope Institute for food Sciences IFS	Bern-Liebefeld	Switzerland
Alip	Sousada	Portugal
Cattle Information Service (CIS)	Teiford	United Kingdom
Centar za controlu kvalitete stocarskih proizvoda	Krizevci	Croatia
Comité du Lait ASBL	Battice	Belgium
Delaval international AB	Tumba	Sweden
Eastern Lab services	Medina Ohio	USA
Estonian Livestock Performance Recording Ltd	Tartu	Estonie
Eurofins Milk Testing Sweden AB	Jönköping	Sweden
Eurofins Steins Laboratory A/S	Vejen	Denmark
Federazione Latterie Alto Adige Soc. Agr. Coop.	Bolzano	Italy
Japan Dairy Technical Association	Tokyo	Japan
KGZS Zavod Ptuj	Ptuj	Slovenia
Korea Animal Improvement Ass.	Anseong-si,gyeonggi-do	South Korea
Laborator pro rozbor mléka Brno, Ceskomoravská spolecnost chovatelú a.s.	Brno	Czech Republic
Laboratorio Standard Latte	Maccarese (Roma)	Italy
Lactanet	Quebec	Canada
Lactanet Ltd, Regional laboratory	Seinajoki	Finland
Merieux Nutriscience South Africa (Midrand)	Midrand	South Africa
Milchkontroll und Rinderzuchtverband eG	Güstrow	Germany
Milchprüfring Bayern	Wolnzach	Germany
Plemenárske sluzby SR s.p.	Zilina	Slovakia
Qlip B.V.,	Zutphen	Netherlands
Tine Ramelklaboratoriet Heimdal	Heimdal	Norway
University of Ljubljana Biotechnical faculty department of Animal Science Institute of Dairy Science and Probiotics	Domzale	Slovenia

ICAR

PROFICIENCY TESTING SCHEME

March 2020

Raw Milk

Enumeration of SOMATIC CELLS

SCC

Lyophilized Milk

Sending date of statistical treatment : 8th April 2020

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

Proficiency test accreditated ISO 17043

ACCRÉDITATION N° 1-2473 PORTÉE DISPONIBLE SUR WWW.COFRAC.FR

Table I : Ranking of the laboratories in %

Nb	%	N°	d	Sd	D	Method
1	3	6	- 4%	4%	6%	B
2	6	23	- 3%	6%	7%	B
3	9	27	- 2%	7%	7%	B
4	13	7	+ 1%	8%	8%	B
5	16	16	+ 1%	10%	10%	B
6	19	38	+ 11%	3%	12%	B
7	22	14	- 12%	1%	12%	B
8	25	35	- 7%	12%	14%	B
9	28	25	- 8%	11%	14%	B
10	31	3	- 5%	16%	17%	B
11	34	10	+ 12%	15%	19%	B
12	38	15	+ 15%	16%	22%	B
13	41	24	- 11%	19%	23%	B
14	44	33	- 19%	16%	25%	B
15	47	1	+ 15%	21%	26%	B
16	50	39	- 24%	14%	28%	A
17	53	26	- 22%	23%	32%	C
18	56	5	- 7%	33%	34%	B
19	59	4	+ 21%	29%	35%	B
20	63	37	+ 34%	31%	46%	B
21	66	13	+ 47%	10%	48%	B
22	69	11	- 6%	51%	51%	B
23	72	32	- 39%	36%	53%	B
24	75	36	- 36%	47%	59%	B
25	78	12	+ 44%	46%	63%	B
26	81	8	- 53%	39%	66%	B
27	84	31	+ 75%	73%	105%	B
28	88	19	+ 74%	75%	105%	B
29	91	9	- 89%	79%	119%	B
30	94	20	+ 305%	265%	403%	B
31	97	21	- 417%	449%	613%	B
32	100	22	- 417%	452%	615%	B
NC		2				
NC		17				
NC		18				
NC		28				
NC		29				
NC		30				
NC		34				

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 :

+/- 10% for d and 10% for Sd

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 29 laboratories using reference metod ISO 13366-1|IDF 148-1 and alternative method ISO 13366-2|IDF 148-2 after outlier discarging using Grubbs test at 5% risk level

A ISO 13366-1|IDF 148-1
B ISO 13366-2|IDF 148-2
C Image Cytometry

(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.(d^2 + Sd^2))

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}	8	2%
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	38	24%

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

Sample / Lab code	A		B		Sr	NL
1	3		3		2	4
2	**		**			
3	3		8		4	4
4	3		15		8	4
5	6		7		5	4
6	4		11		6	4
7	16		20		13	4
8	11		4		6	4
9	4		7		4	4
10	5		14		7	4
11	28	*	4		14	4
12	2		24		12	4
13	66	*	7		33	4
14	11		22		12	4
15	1		49	*	25	4
16	1		4		2	4
17	**		**			
18	**		**			
19	5		17		9	4
20	35	*	143	*	74	4
21	6		5		4	4
22	7		5		4	4
23	11		40		21	4
24	4		2		2	4
25	7		0		4	4
26	4		11		6	4
27	15		9		9	4
28	**		**			
29	**		**			
30	**		**			
31	3		7		4	4
32	2		10		5	4
33	12		22		13	4
34	**		**			
35	4		2		2	4
36	5		6		4	4
37	**		23		16	2
38	13		17		11	4
39	**		8		6	2
Sr	11		21			124
r	25		126			
NE	60		64			
L	22		42			

Sr : repeatability standard deviation of each laboratory limit : Cf 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 10^3 cells / ml

Sample / Lab code	A	B
1	145	782
2		
3	150	740
4	145	792
5	159	728
6	143	749
7	150	751
8	122	682
9	114	625
10	146	775
11	106	781
12	154	823
13	192 *	791
14	134	743
15	148	779
16	139	762
17		
18		
19	163	869
20	250 *	1197 *
21	54 *	95 *
22	57 *	93 *
23	145	748
24	146	732
25	144	740
26	139	721
27	147	749
28		
29		
30		
31	165	869
32	132	697
33	137	727
34		
35	145	741
36	142	693
37	155	805
38	153	767
39	131	724
M	143	754
REF.	144	755
SD	13	51

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 29 laboratories using the reference method ISO 13366 | IDF 148-1 and alternative method ISO 13366-2 | IDF 148-2, after outlier discarging using Grubbs test at 5% risk level

Table IV : Outlier identification

Sample	A	B
Outliers Cochran	11;13 20	15;20
Outlier Grubbs	13;20 21;22	20;21 22
sr	5	10
SR	12	52
sr %	4%	1%
SR %	8%	7%

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

Sample / Lab code	A	B	d	Sd_{lab}	t
1	+ 0%	+ 4%	+ 15%	21%	1,04
2					
3	+ 4%	- 2%	- 5%	16%	0,45
4	+ 0%	+ 5%	+ 21%	29%	1,03
5	+ 10%	- 4%	- 7%	33%	0,29
6	- 1%	- 1%	- 4%	4%	1,37
7	+ 4%	- 0%	+ 1%	8%	0,25
8	- 16%	- 10%	- 53%	39%	1,90
9	- 21%	- 17%	- 89%	79%	1,60
10	+ 1%	+ 3%	+ 12%	15%	1,16
11	- 26%	+ 3%	- 6%	51%	0,18
12	+ 7%	+ 9%	+ 44%	46%	1,34
13	+ 33%	+ 5%	+ 47%	10%	6,88
14	- 7%	- 2%	- 12%	1%	18,54
15	+ 2%	+ 3%	+ 15%	16%	1,35
16	- 4%	+ 1%	+ 1%	10%	0,15
17					
18					
19	+ 13%	+ 15%	+ 74%	75%	1,39
20	+ 73%	+ 59%	+ 305%	265%	1,63
21	- 62%	- 87%	- 417%	449%	1,32
22	- 61%	- 88%	- 417%	452%	1,30
23	+ 0%	- 1%	- 3%	6%	0,85
24	+ 1%	- 3%	- 11%	19%	0,84
25	- 0%	- 2%	- 8%	11%	1,07
26	- 3%	- 5%	- 22%	23%	1,34
27	+ 2%	- 1%	- 2%	7%	0,42
28					
29					
30					
31	+ 14%	+ 15%	+ 75%	73%	1,44
32	- 8%	- 8%	- 39%	36%	1,52
33	- 5%	- 4%	- 19%	16%	1,67
34					
35	+ 1%	- 2%	- 7%	12%	0,86
36	- 2%	- 8%	- 36%	47%	1,08
37	+ 8%	+ 7%	+ 34%	31%	1,57
38	+ 6%	+ 2%	+ 11%	3%	6,16
39	- 9%	- 4%	- 24%	14%	2,47
d	- 1%	- 0%	- 3%	24%	
Sd	9%	7%			

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

Upper limits : $\bar{d}$ = +/- 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	A	B
1	+0,04	+0,53
2		
3	+0,42	-0,29
4	+0,04	+0,72
5	+1,14	-0,53
6	-0,07	-0,12
7	+0,46	-0,07
8	-1,70	-1,43
9	-2,27	-2,55
10	+0,12	+0,40
11	-2,88	+0,52
12	+0,76	+1,35
13	+3,64	+0,70
14	-0,79	-0,23
15	+0,27	+0,47
16	-0,41	+0,14
17		
18		
19	+1,40	+2,23
20	+8,00	+8,67
21	-6,82	-12,96
22	-6,63	-13,00
23	+0,04	-0,13
24	+0,15	-0,44
25	-0,04	-0,29
26	-0,38	-0,67
27	+0,19	-0,12
28		
29		
30		
31	+1,56	+2,23
32	-0,91	-1,13
33	-0,53	-0,54
34		
35	+0,08	-0,27
36	-0,19	-1,21
37	+0,84	+0,98
38	+0,65	+0,23
39	-0,98	-0,60

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

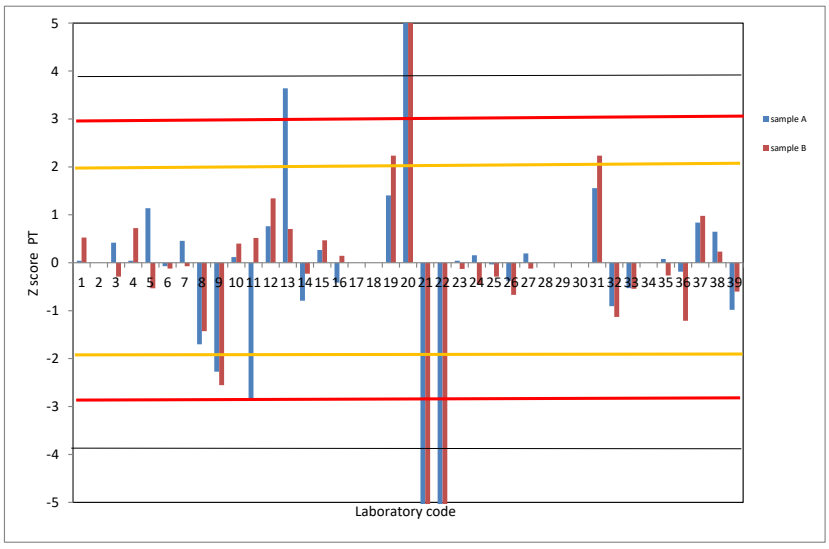


Table VII : Zscore of the different laboratories for each sample.

ZS calculated on the standard deviation of reproducibility of the method

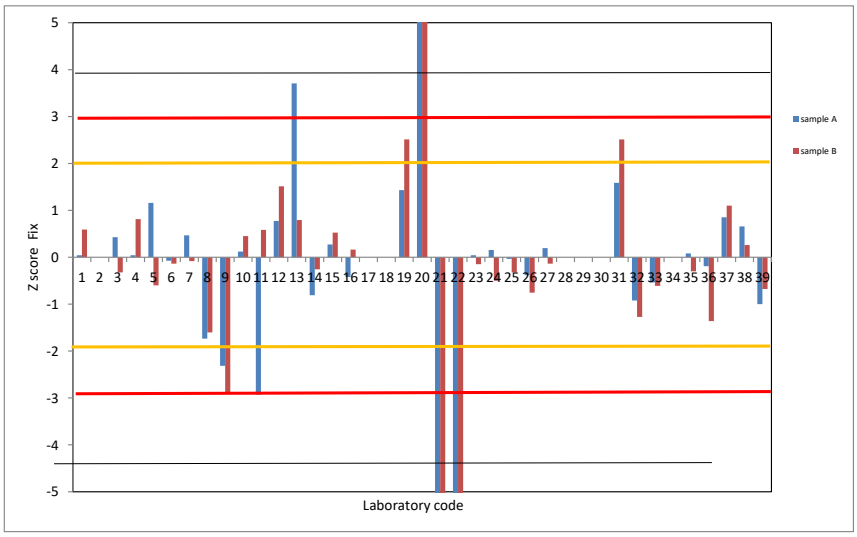
Sample Lab code	A	B
1	+0,04	+0,59
2		
3	+0,43	-0,32
4	+0,04	+0,81
5	+1,16	-0,60
6	-0,07	-0,14
7	+0,47	-0,08
8	-1,73	-1,60
9	-2,31	-2,87
10	+0,12	+0,45
11	-2,93	+0,58
12	+0,77	+1,51
13	+3,71	+0,79
14	-0,81	-0,26
15	+0,27	+0,53
16	-0,42	+0,16
17		
18		
19	+1,43	+2,51
20	+8,15	+9,76
21	-6,94	-14,58
22	-6,75	-14,62
23	+0,04	-0,15
24	+0,16	-0,50
25	-0,04	-0,32
26	-0,38	-0,75
27	+0,20	-0,14
28		
29		
30		
31	+1,58	+2,51
32	-0,92	-1,27
33	-0,54	-0,61
34		
35	+0,08	-0,30
36	-0,19	-1,36
37	+0,85	+1,10
38	+0,66	+0,26
39	-1,00	-0,68

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 5./8

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



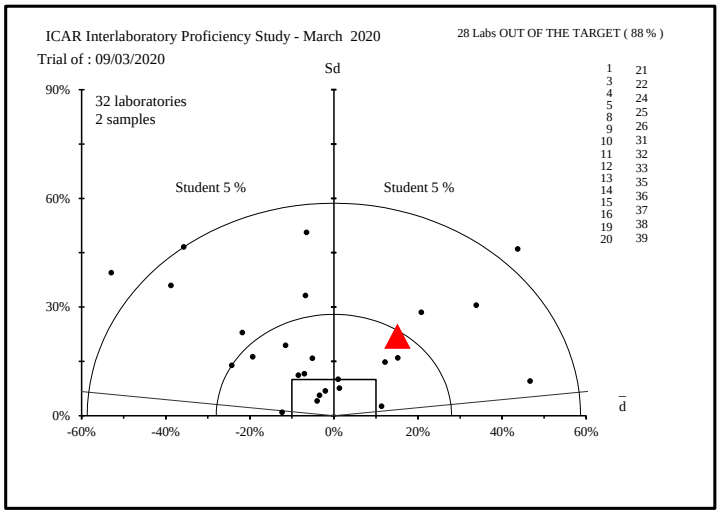


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

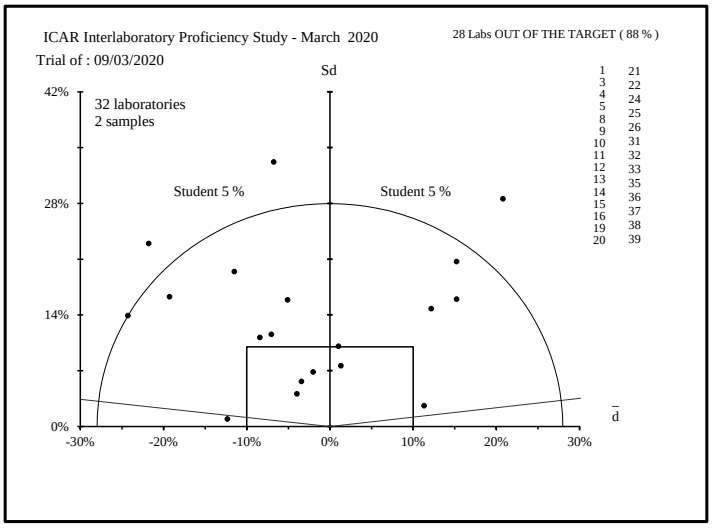


Figure 1a : ACCURACY - Evaluation of the individual performances (to see table I).
different scale