THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

ICAR PROFICIENCY TEST - SEPTEMBER 2018

Raw cow milk

“Routine” Methods

THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

FRAME OF ACTIVITY :

ICAR MILK ANALYSES SUB-COMMITTEE (MA SC)

ORGANISER: ICAR, VIA SAVOIA 78, I-00198 ROME, ITALY

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Table of contents

1. Introduction

Dear Participant,

Thank you for participating in the ICAR Proficiency Test (PT) September 2018 !

This is the fifth round that ICAR organized sine 2016 !!!

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 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. According the results obtained the MA SC will decide eventually to revise. During the meeting of Milk Analyses Sub Committee held in Copenhagen in June 2016 the experts decided to 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.

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

In the second part of the report the statistical elaboration followed the template approved by ICAR's Milk Analyses Sub Committee chaired by Dr. Gavin Scott (NZ). 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 2018 with at least one parameter is reported below and upload on ICAR website (available here)

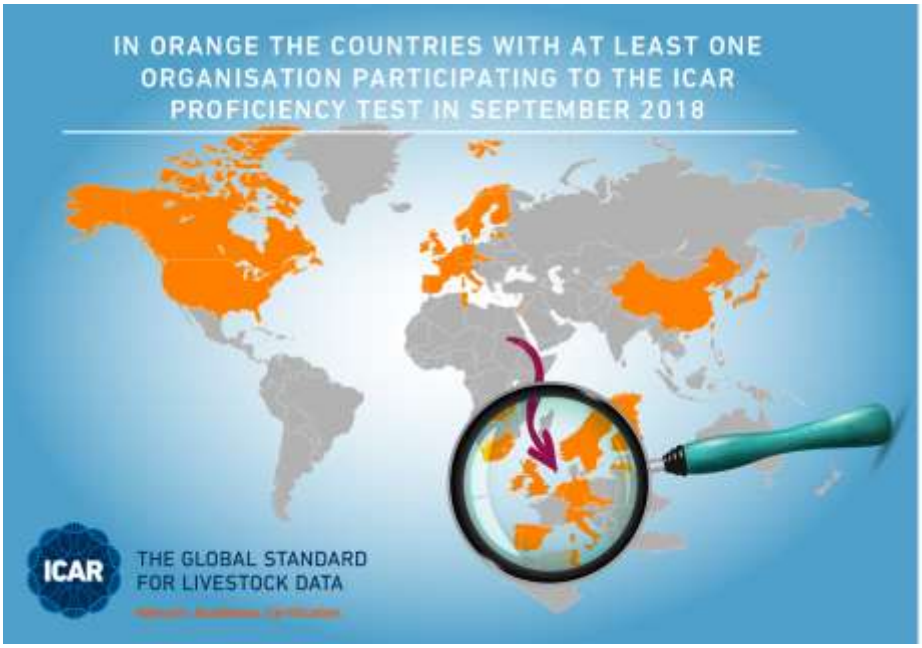


Table 1. Participating milk laboratories to the ICAR Proficiency Test (September 2018)

Institute	Country
Laboratory of milk analysis of the Valorisation of Agricultural Products, Department of Agricultural products of Walloon Agricultural Research Centre	Belgium
Valacta - Centre d'Expertise en Production Laitière du Québec	Canada
Horizon Lab Ltd	Canada
Dairy Cattle Research Centre of Shandong Academy of Agricultural Sciences	China
Shanghai Dairy Cattle Breeding Center Co., Ltd	China
Laborator pro rozbor mléka Brno, Ceskomoravská spolecnost chovatelú a.s.	Czech Republic
Eurofins Steins Laboratorium A/S	Denmark
ChemoMetec A/S	Denmark
Eesti Pollumajandusloomade Joudluskontrolli AS, Milk Analysing Laboratory	Estonia
Valio Ltd, Regional laboratory	Finland
Osuuskunta Satamaito, Laboratorio Kati Järvinen	Finland
ACTALIA / ACTILAIT / CECALAIT	France
Milchprüfring Baden-Württemberg e.V., Zentrallabor Kirchheim	Germany
Teagasc, Technical Services Laboratory	Ireland
Central Milk Laboratory – ICBA	Israel
Associazione Italiana Allevatori, Laboratorio Standard Latte (LSL-AIA)	Italy
Japan Dairy Technical Association	Japan
Artificial Insemination and Stock Breeding Station, Joint Stock Company Siguldas	Latvia
Pieno Tyrimai, State Laboratory for Milk Control	Lithuania
Tine Ramelklaboratoriet Bergen	Norway
Tine Ramelklaboratoriet Heimdal	Norway
Laboratorium Oceny Mleka, Krajowego Centrum Hodowli Zwierzat (KCHZ), Laboratorium Referencyjne z siedziba w Parzniewie	*Poland*
Associação Interprofissional do Leite e Lacticínios	Portugal
LRV-LABORATORIO REGIONAL DE VETERINARIA	Portugal
Laboratorija za ispitivanje kvaliteta mleka, Poljoprivredni fakultet Novi Sad	Serbia
Plemenárske služby SR, š.p., Centrálne laboratórium rozboru mlieka (Milk Laboratory, Slovak Agricultural Research Centre)	Slovak Republic
University of Ljubljana, Biotechnical Faculty, Zootech. Dept., Laboratory for Dairying	Slovenia
KGZS Zavod Ptuj	Slovenia
Merieux NutriSccience South Africa (Midrand)	*South Africa*

Institute	Country
Mérieux NutriSciences South Africa	South Africa
Department of Production Animal Studies, Facult of Veterinary Science	South Africa
Center for Green Dairy Technology, Han Kyong University	South Korea
Laboratorio Agroalimentario de Santander	Spain
Eurofins Steins Laboratory A/B	Sweden
Suisselab AG	Switzerland
Agroscope Institute for food Sciences IFS	Switzerland
Council of Agriculture, Executive Yuan, Taiwan Animal Germplasm Center of TLRI	Taiwan
Qlip B.V.	The Netherlands
Office de l'Elevage et des Pâturages, Laboratoire de Contrôle Laitier, Direction de l'Amélioration Génétique	Tunisia
CIS	United Kingdom
Eastern Laboratory Services	USA
Vetlab Agricultural Showgrouds	Zambia

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
FOR LIVESTOCK DATA

Routine Methods
Laboratory participation codes and Performance analyses

ICAR PT RT0918

Laboratory Name	

A — Your participation Codes

	Fat$_{rout}$	Protein$_{rout}$	Lactose$_{rout}$	Urea$_{rout}$	BHB	PAG
Subscription	Yes	Yes	Yes	Yes	No	No
Participation Codes	1	1	1	1		
Are all the sample results received?	Yes	Yes	Yes	Yes	No	No

B — Data results received on time

Yes	14-09-2018

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

	Fat$_{rout}$	Protein*$_{rout}$	Lactose$_{rout}$	Urea$_{rout}$	BHB	PAG
	g/100g	nitrogen g/100g	g/100g	mg/dl	mmol/L	
	Yes	Yes	Yes	No		

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

D — Ranking of your lab

	Fat$_{rout}$	Protein*$_{rout}$	Lactose$_{rout}$	Urea$_{rout}$	BHB	PAG
	g/100g	nitrogen g/100g	g/100g	mg/dl	mmol/L	
Code	1	1	1	1		
%	42	96	52	73		
d	0.011	0.164	0.022	6.494		
Sd	0.031	0.022	0.027	1.310		
D	0.033	0.165	0.035	6.625		
Method	IR	IR	IR	IR		
Limits						
d	0,020	0,025	0,10	2,5	10	0,045
Sd	0,030	0,020	0,10	1,5	10	0,045

E — Outliers

	Fat$_{rout}$	Protein*$_{rout}$	Lactose$_{rout}$	Urea$_{rout}$	BHB	PAG
	g/100g	nitrogen g/100g	g/100g	mg/dl	mmol/L	
Sample 1		Grubbs				
Sample 2		Grubbs				
Sample 3						
Sample 4		Grubbs				
Sample 5						
Sample 6		Grubbs				
Sample 7						
Sample 8						
Sample 9		Grubbs	Cochran			
Sample 10		Grubbs				

F

Repeatability

Your "r" performance

	Fat	Protein	Lactose	Urea	BHB	PAG
	g/100g	nitrogen g/100g	g/100g	mg/dl	mmol/L	
Sample 1	0.000	0.010	0.000	0.500		
Sample 2	0.010	0.000	0.000	0.250		
Sample 3	0.020	0.010	0.010	0.250		
Sample 4	0.010	0.000	0.020	1		
Sample 5	0.020	0.010	0.020	0.250		
Sample 6	0.020	0.000	0.010	0.500		
Sample 7	0.010	0.010	0.020	0.500		
Sample 8	0.010	0.000	0.020	0.250		
Sample 9	0.020	0.010	0.050	0.750		
Sample 10	0.010	0.000	0.020	1.250		

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	BHB	
	g/100g	g/100g	g/100g	mg/dl	mmol/L	
	ISO 1211 IDF 1D	ISO 8968 IDF 20	ISO 22662 IDF 198	ISO 14637 IDF 195	Indicative	
	0,043	0,038	0,06	1,52	0,03	

G

Your Z-Score PT

	Fat	Protein	Lactose	Urea	BHB
Sample 1	-0.285	-4.853	-1.039	0.616	
Sample 2	-0.024	-3.714	-0.738	0.357	
Sample 3	-0.098	-2.681	-0.811	0.501	
Sample 4	-0.514	-5.716	-0.348	0.585	
Sample 5	1.371	-2.512	-0.561	0.550	
Sample 6	0.060	-5.869	-0.069	0.436	
Sample 7	0.842	-2.361	-0.183	0.563	
Sample 8	0.352	-2.735	-0.148	0.441	
Sample 9	-0.174	-6.376	0.593	0.493	
Sample 10	1.591	-4.869	-0.632	0.355	

Your Z-Score Fix

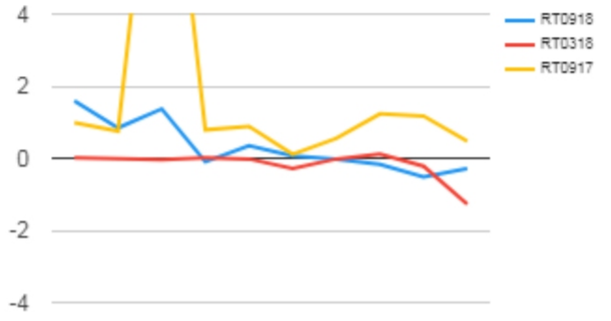
	Fat	Protein	Lactose	Urea	BHB
Sample 1	-0.508	-4.827	-1.668	2.724	
Sample 2	-0.030	-4.015	-1.137	2.752	
Sample 3	-0.121	-3.629	-1.195	4.268	
Sample 4	-0.758	-4.467	-0.437	3.726	
Sample 5	1.173	-3.457	-0.488	3.142	
Sample 6	0.070	-4.507	-0.101	3.441	
Sample 7	1.048	-3.218	-0.291	2.912	
Sample 8	0.394	-3.931	-0.190	4.147	
Sample 9	-0.207	-4.830	0.773	4.898	
Sample 10	1.659	-4.103	-0.827	3.868	

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.

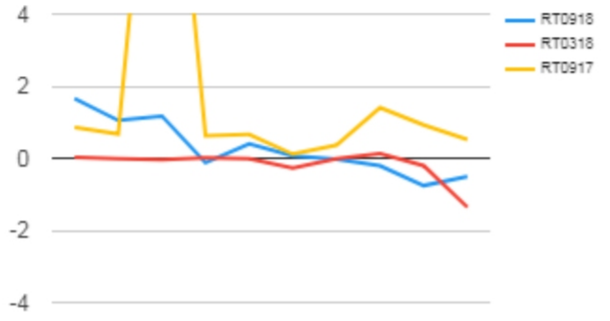
Interpretation Z-Score

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

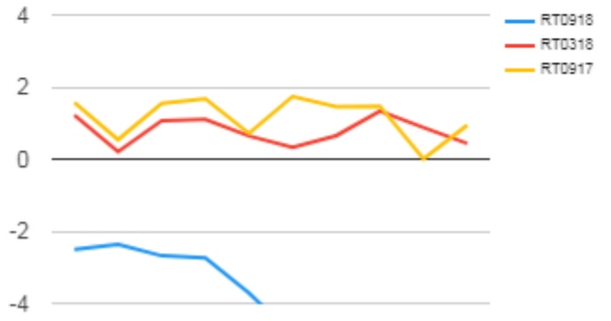
ZSCORE-PT - fat_rout



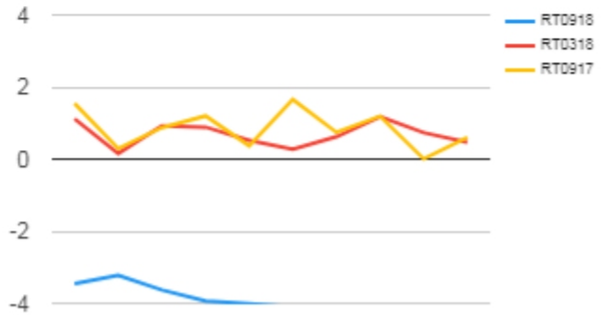
ZSCORE-FIX - fat_rout



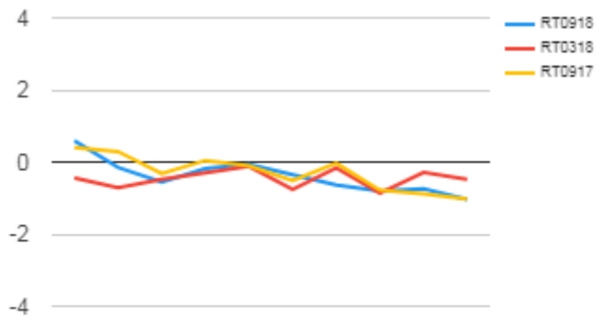
ZSCORE-PT - protein_rout



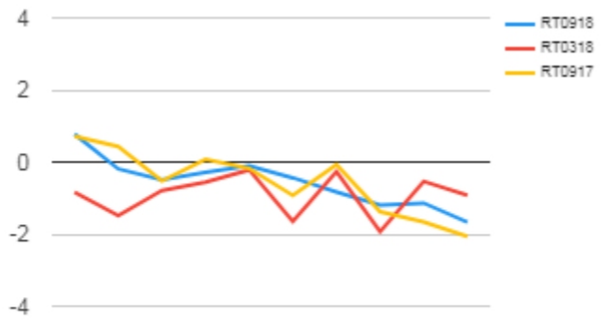
ZSCORE-FIX - protein_rout



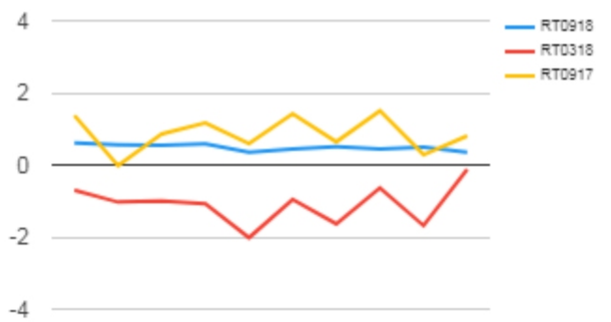
ZSCORE-PT - lactose_rout



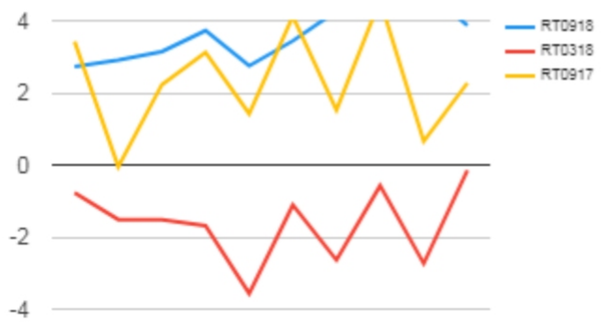
ZSCORE-FIX - lactose_rout



ZSCORE-PT - urea_rout



ZSCORE-FIX - urea_rout



ICAR
PROFICIENCY TESTING SCHEME

September 2018

Raw Milk

Determination of FAT CONTENT
Routine method

Sending date of statistical treatment : 18.10.2018

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

ACTALIA CECALAIT

cofrac COMPARAISONS INTERLABORATOIRES

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

Table 1 : **Ranking of the laboratories** Units : g / 100 g

Nb	%	N°	Sign	d	Sd	D	Method
1	4	3	-	0.002	0.009	0.009	IR
2	8	18	+	0.002	0.010	0.010	IR
3	12	4	+	0.010	0.009	0.013	IR
4	15	12	-	0.002	0.014	0.014	IR
5	19	9	+	0.014	0.015	0.021	IR
6	23	15	+	0.024	0.011	0.026	IR
7	27	20	-	0.012	0.024	0.026	IR
8	31	17	-	0.022	0.022	0.031	IR
9	35	5	-	0.021	0.023	0.031	IR
10	38	19	+	0.029	0.015	0.033	IR
11	42	1	+	0.011	0.031	0.033	IR
12	46	24	-	0.020	0.028	0.034	IR
13	50	6	-	0.033	0.012	0.035	IR
14	54	21	-	0.021	0.031	0.037	IR
15	58	16	+	0.040	0.023	0.047	IR
16	62	7	+	0.009	0.049	0.050	IR
17	65	10	-	0.043	0.039	0.058	IR
18	69	13	-	0.060	0.018	0.063	IR
19	73	2	+	0.064	0.015	0.066	IR
20	77	22	+	0.075	0.024	0.079	IR
21	81	14	+	0.072	0.050	0.088	IR
22	85	23	-	0.078	0.050	0.093	IR
23	88	11	-	0.099	0.014	0.100	IR
24	92	26	-	0.224	0.195	0.297	IR
25	96	25	-	0.036	0.315	0.317	IR
26	100	8	+	0.196	1.155	1.171	IR

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 26 sets of results send by 26 laboratories using routine method ISO 9622|IDF 141, 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}	0.006
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0.049

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0.000	0.010	0.020	0.010	0.020	0.020	0.010	0.010	0.020	0.010	0.010	20
2	0.020	0.000	0.010	0.010	0.000	0.010	0.000	0.010	0.010	0.000	0.007	20
3	0.010	0.010	0.000	0.000	0.010	0.000	0.010	0.000	0.000	0.000	0.004	20
4	0.010	0.010	0.000	0.000	0.010	0.000	0.000	0.000	0.010	0.010	0.005	20
5	0.010	0.010	0.000	0.010	0.010	0.010	0.000	0.000	0.000	0.000	0.005	20
6	0.010	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.010	0.000	0.004	20
7	0.010	0.010	0.010	0.010	0.020	0.010	0.010	0.010	0.000	0.000	0.007	20
8	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.002	20
9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.003	20
10	0.010	0.010	0.000	0.000	0.010	0.010	0.000	0.000	0.000	0.010	0.005	20
11	0.010	0.010	0.010	0.010	0.010	0.000	0.000	0.010	0.000	0.000	0.005	20
12	0.000	0.000	0.010	0.000	0.000	0.010	0.000	0.010	0.010	0.000	0.004	20
13	0.002	0.011	0.004	0.002	0.004	0.001	0.003	0.005	0.001	0.002	0.003	20
14	0.060 *	0.010	0.010	0.020	0.010	0.000	0.010	0.010	0.000	0.010	0.015	20
15	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	20
16	0.020	0.010	0.010	0.020	0.010	0.000	0.000	0.010	0.020	0.000	0.009	20
17	0.000	0.000	0.000	0.010	0.000	0.010	0.000	0.000	0.010	0.010	0.004	20
18	0.010	0.000	0.000	0.010	0.000	0.010	0.000	0.000	0.010	0.000	0.004	20
19	0.000	0.010	0.010	0.000	0.000	0.010	0.000	0.000	0.000	0.010	0.004	20
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	20
21	0.010	0.000	0.000	0.000	0.010	0.020	0.010	0.010	0.010	0.010	0.007	20
22	0.030	0.010	0.000	0.010	0.000	0.000	0.010	0.000	0.010	0.010	0.008	20
23	0.011	0.008	0.005	0.018	0.006	0.002	0.003	0.010	0.013	0.019	0.008	20
24	0.030	0.010	0.010	0.000	0.010	0.000	0.010	0.010	0.000	0.000	0.008	20
25	0.000	0.000	0.000	0.010	0.000	0.010	0.010	0.010	0.020	0.000	0.006	20
26	0.020	0.020	0.140 *	0.090 *	0.030 *	0.070 *	0.050 *	0.000	0.100 *	0.010	0.048	20
Sr	0.012	0.006	0.020	0.014	0.007	0.011	0.008	0.005	0.015	0.005		520
NE	52	52	52	52	52	52	52	52	52	52		
L	0.037	0.024	0.021	0.027	0.024	0.025	0.017	0.020	0.028	0.020		

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 according ISO 9622|IDF 141

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

Sample / Lab Code	1	2	3	4	5	6	7	8	9	10
1	4.770	3.525	2.850	4.185	2.210	3.260	1.795	2.935	3.600	1.555
2	4.820	3.600	2.925	4.295	2.210	3.325	1.820	2.985	3.675	1.560
3	4.805	3.525	2.840	4.210	2.155	3.250	1.755	2.920	3.600	1.500
4	4.785	3.535	2.870	4.210	2.175	3.270	1.770	2.940	3.615	1.505
5	4.815	3.515	2.820	4.205	2.125	3.235	1.700	2.910	3.600	1.440
6	4.775	3.500	2.820	4.170	2.140	3.215	1.730	2.890	3.555	1.450
7	4.735	3.485	2.955	4.255	2.190	3.285	1.755	2.875	3.660	1.470
8	4.710	4.480 *	4.140 *	3.495 *	1.500 *	3.080 *	2.780 *	2.420 *	2.130 *	3.800 *
9	4.810	3.560	2.850	4.250	2.160	3.270	1.750	2.935	3.635	1.500
10	4.695	3.465	2.810	4.120	2.155	3.205	1.770	2.890	3.540	1.495
11	4.695	3.425	2.745	4.105	2.035 *	3.170	1.660	2.825	3.520	1.410
12	4.810	3.530	2.845	4.220	2.140	3.255	1.740	2.925	3.625	1.470
13	4.720	3.453	2.797	4.125	2.124	3.198	1.718	2.874	3.527	1.440
14	4.980	3.605	2.915	4.330	2.195	3.330	1.785	2.975	3.680	1.505
15	4.830	3.550	2.865	4.250	2.170	3.270	1.780	2.950	3.630	1.520
16	4.870	3.585	2.875	4.280	2.165	3.290	1.780	2.945	3.660	1.530
17	4.750	3.490	2.820	4.165	2.150	3.235	1.760	2.910	3.575	1.505
18	4.815	3.530	2.850	4.205	2.160	3.255	1.760	2.920	3.605	1.500
19	4.820	3.535	2.875	4.230	2.190	3.285	1.800	2.960	3.630	1.545
20	4.820	3.550	2.830	4.210	2.150	3.240	1.730	2.870	3.600	1.460
21	4.835	3.510	2.820	4.220	2.105	3.240	1.705	2.895	3.605	1.435
22	4.905	3.615	2.930	4.295	2.210	3.340	1.805	3.010	3.695	1.525
23	4.682	3.481	2.676 *	4.182	2.078	3.182	1.618	2.885	3.584	1.434
24	4.755	3.485	2.825	4.160	2.155	3.230	1.775	2.905	3.570	1.520
25	4.900	3.610	2.920	4.295	2.200	3.335	1.785	2.995	2.680 *	1.500
26	4.730	3.480	2.290 *	3.805 *	1.945 *	2.995 *	1.655	2.860	3.140 *	1.435
M	4.794	3.526	2.854	4.216	2.161	3.257	1.748	2.919	3.608	1.488
REF.	4.790	3.526	2.855	4.215	2.163	3.257	1.753	2.919	3.608	1.489
SD	0.071	0.051	0.049	0.059	0.034	0.046	0.050	0.045	0.048	0.042

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 26 laboratories using the Routine method ISO 9622 | IDF 141 , after outliers discarging using Grubbs test at 5 % risk level.

Table IV : Outliers identification

Sample	1	2	3	4	5	6	7	8	9	10
Outliers Cochran	14		26	26	26	26	26		26	
Outliers Grubbs		8	8; 23; 26	8; 26	8; 11; 26	8; 26	8	8	8; 25; 26	8
Sr	0.009	0.006	0.005	0.006	0.006	0.006	0.004	0.005	0.006	0.005
SR	0.062	0.051	0.050	0.059	0.034	0.047	0.047	0.045	0.048	0.042

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	- 0.020	- 0.001	- 0.005	- 0.030	+ 0.047	+ 0.003	+ 0.042	+ 0.016	- 0.008	+ 0.066	+ 0.011	0.031	1.10
2	+ 0.030	+ 0.074	+ 0.070	+ 0.080	+ 0.047	+ 0.068	+ 0.067	+ 0.066	+ 0.067	+ 0.071	+ 0.064	0.015	13.77
3	+ 0.015	- 0.001	- 0.015	- 0.005	- 0.008	- 0.007	+ 0.002	+ 0.001	- 0.008	+ 0.011	- 0.002	0.009	0.56
4	- 0.005	+ 0.009	+ 0.015	- 0.005	+ 0.012	+ 0.013	+ 0.017	+ 0.021	+ 0.007	+ 0.016	+ 0.010	0.009	3.48
5	+ 0.025	- 0.011	- 0.035	- 0.010	- 0.038	- 0.022	- 0.053	- 0.009	- 0.008	- 0.049	- 0.021	0.023	2.87
6	- 0.015	- 0.026	- 0.035	- 0.045	- 0.023	- 0.042	- 0.023	- 0.029	- 0.053	- 0.039	- 0.033	0.012	8.88
7	- 0.055	- 0.041	+ 0.100	+ 0.040	+ 0.027	+ 0.028	+ 0.002	- 0.044	+ 0.052	- 0.019	+ 0.009	0.049	0.57
8	- 0.080	+ 0.954	+ 1.285	- 0.720	- 0.663	- 0.177	+ 1.027	- 0.499	- 1.478	+ 2.311	+ 0.196	1.155	0.54
9	+ 0.020	+ 0.034	- 0.005	+ 0.035	- 0.003	+ 0.013	- 0.003	+ 0.016	+ 0.027	+ 0.011	+ 0.014	0.015	3.08
10	- 0.095	- 0.061	- 0.045	- 0.095	- 0.008	- 0.052	+ 0.017	- 0.029	- 0.068	+ 0.006	- 0.043	0.039	3.46
11	- 0.095	- 0.101	- 0.110	- 0.110	- 0.128	- 0.087	- 0.093	- 0.094	- 0.088	- 0.079	- 0.099	0.014	21.84
12	+ 0.020	+ 0.004	- 0.010	+ 0.005	- 0.023	- 0.002	- 0.013	+ 0.006	+ 0.017	- 0.019	- 0.002	0.014	0.36
13	- 0.070	- 0.074	- 0.058	- 0.090	- 0.039	- 0.060	- 0.036	- 0.046	- 0.082	- 0.049	- 0.060	0.018	10.34
14	+ 0.190	+ 0.079	+ 0.060	+ 0.115	+ 0.032	+ 0.073	+ 0.032	+ 0.056	+ 0.072	+ 0.016	+ 0.072	0.050	4.58
15	+ 0.040	+ 0.024	+ 0.010	+ 0.035	+ 0.007	+ 0.013	+ 0.027	+ 0.031	+ 0.022	+ 0.031	+ 0.024	0.011	6.88
16	+ 0.080	+ 0.059	+ 0.020	+ 0.065	+ 0.002	+ 0.033	+ 0.027	+ 0.026	+ 0.052	+ 0.041	+ 0.040	0.023	5.45
17	- 0.040	- 0.036	- 0.035	- 0.050	- 0.013	- 0.022	+ 0.007	- 0.009	- 0.033	+ 0.016	- 0.022	0.022	3.17
18	+ 0.025	+ 0.004	- 0.005	- 0.010	- 0.003	- 0.002	+ 0.007	+ 0.001	- 0.003	+ 0.011	+ 0.002	0.010	0.75
19	+ 0.030	+ 0.009	+ 0.020	+ 0.015	+ 0.027	+ 0.028	+ 0.047	+ 0.041	+ 0.022	+ 0.056	+ 0.029	0.015	6.30
20	+ 0.030	+ 0.024	- 0.025	- 0.005	- 0.013	- 0.017	- 0.023	- 0.049	- 0.008	- 0.029	- 0.012	0.024	1.55
21	+ 0.045	- 0.016	- 0.035	+ 0.005	- 0.058	- 0.017	- 0.048	- 0.024	- 0.003	- 0.054	- 0.021	0.031	2.10
22	+ 0.115	+ 0.089	+ 0.075	+ 0.080	+ 0.047	+ 0.083	+ 0.052	+ 0.091	+ 0.087	+ 0.036	+ 0.075	0.024	10.07
23	- 0.109	- 0.045	- 0.179	- 0.033	- 0.085	- 0.075	- 0.136	- 0.034	- 0.025	- 0.055	- 0.078	0.050	4.87
24	- 0.035	- 0.041	- 0.030	- 0.055	- 0.008	- 0.027	+ 0.022	- 0.014	- 0.038	+ 0.031	- 0.020	0.028	2.23
25	+ 0.110	+ 0.084	+ 0.065	+ 0.080	+ 0.037	+ 0.078	+ 0.032	+ 0.076	- 0.928	+ 0.011	- 0.036	0.315	0.36
26	- 0.060	- 0.046	- 0.565	- 0.410	- 0.218	- 0.262	- 0.098	- 0.059	- 0.468	- 0.054	- 0.224	0.195	3.63
d	+ 0.003	- 0.000	- 0.000	+ 0.000	- 0.002	- 0.000	- 0.005	+ 0.000	- 0.000	- 0.000	- 0.005	0.238	
Sd	0.071	0.051	0.049	0.059	0.034	0.046	0.050	0.045	0.048	0.042	0.050		

d = mean of differences Sd_{lab} = 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 9622|IDF 141 : Precision of the method : Sr = 0.014 g / 100 g
SR = 0,04 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	-0.28	-0.02	-0.10	-0.51	+1.37	+0.06	+0.84	+0.35	-0.17	+1.59
2	+0.42	+1.45	+1.42	+1.35	+1.37	+1.46	+1.34	+1.47	+1.40	+1.71
3	+0.21	-0.02	-0.30	-0.09	-0.24	-0.15	+0.04	+0.02	-0.17	+0.27
4	-0.07	+0.17	+0.31	-0.09	+0.35	+0.28	+0.34	+0.46	+0.14	+0.39
5	+0.35	-0.22	-0.70	-0.17	-1.11	-0.48	-1.07	-0.21	-0.17	-1.17
6	-0.21	-0.52	-0.70	-0.77	-0.67	-0.91	-0.46	-0.65	-1.12	-0.93
7	-0.78	-0.81	+2.03	+0.67	+0.79	+0.60	+0.04	-0.99	+1.09	-0.45
8	-1.13	+18.79	+25.99	-12.21	-19.37	-3.81	+20.64	-11.12	-31.04	+55.42
9	+0.28	+0.67	-0.10	+0.59	-0.09	+0.28	-0.06	+0.35	+0.56	+0.27
10	-1.34	-1.21	-0.91	-1.62	-0.24	-1.12	+0.34	-0.65	-1.43	+0.15
11	-1.34	-1.99	-2.22	-1.87	-3.74	-1.88	-1.87	-2.10	-1.85	-1.89
12	+0.28	+0.07	-0.20	+0.08	-0.67	-0.05	-0.26	+0.13	+0.35	-0.45
13	-0.99	-1.45	-1.17	-1.53	-1.14	-1.29	-0.72	-1.02	-1.72	-1.17
14	+2.66	+1.55	+1.22	+1.94	+0.93	+1.57	+0.64	+1.24	+1.51	+0.39
15	+0.56	+0.47	+0.21	+0.59	+0.20	+0.28	+0.54	+0.69	+0.46	+0.75
16	+1.12	+1.16	+0.41	+1.10	+0.06	+0.71	+0.54	+0.57	+1.09	+0.99
17	-0.56	-0.71	-0.70	-0.85	-0.38	-0.48	+0.14	-0.21	-0.70	+0.39
18	+0.35	+0.07	-0.10	-0.17	-0.09	-0.05	+0.14	+0.02	-0.07	+0.27
19	+0.42	+0.17	+0.41	+0.25	+0.79	+0.60	+0.94	+0.91	+0.46	+1.35
20	+0.42	+0.47	-0.50	-0.09	-0.38	-0.37	-0.46	-1.10	-0.17	-0.69
21	+0.63	-0.32	-0.70	+0.08	-1.70	-0.37	-0.97	-0.54	-0.07	-1.29
22	+1.61	+1.75	+1.52	+1.35	+1.37	+1.78	+1.04	+2.02	+1.82	+0.87
23	-1.52	-0.89	-3.63	-0.56	-2.49	-1.62	-2.72	-0.76	-0.52	-1.32
24	-0.49	-0.81	-0.60	-0.94	-0.24	-0.59	+0.44	-0.32	-0.80	+0.75
25	+1.54	+1.65	+1.32	+1.35	+1.08	+1.67	+0.64	+1.69	-19.49	+0.27
26	-0.85	-0.91	-11.42	-6.96	-6.37	-5.64	-1.97	-1.32	-9.83	-1.29

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

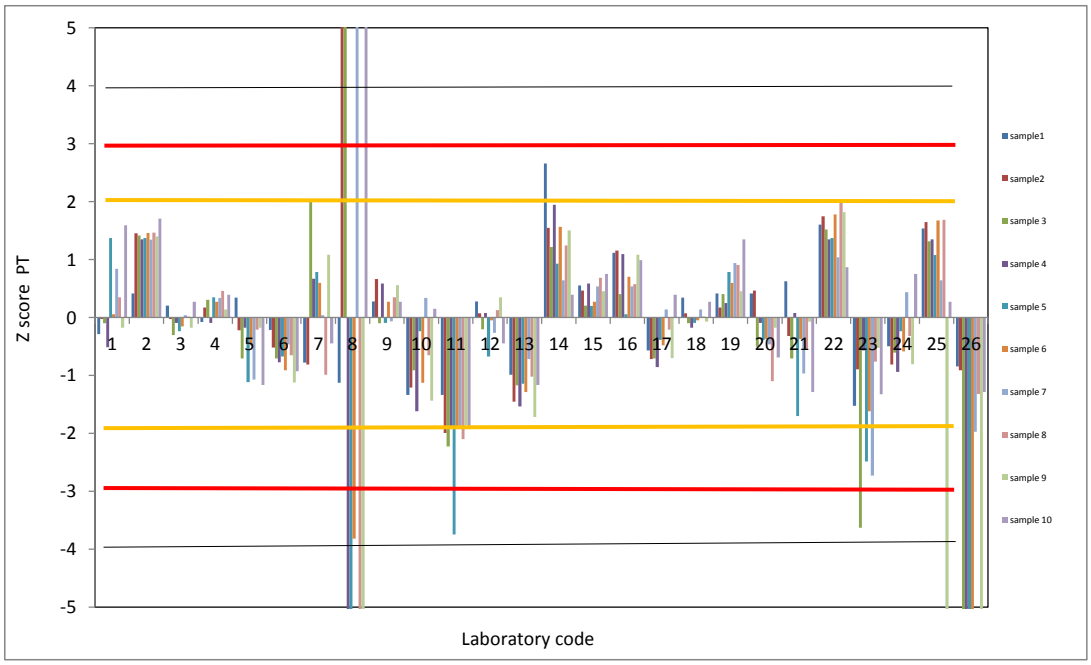


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

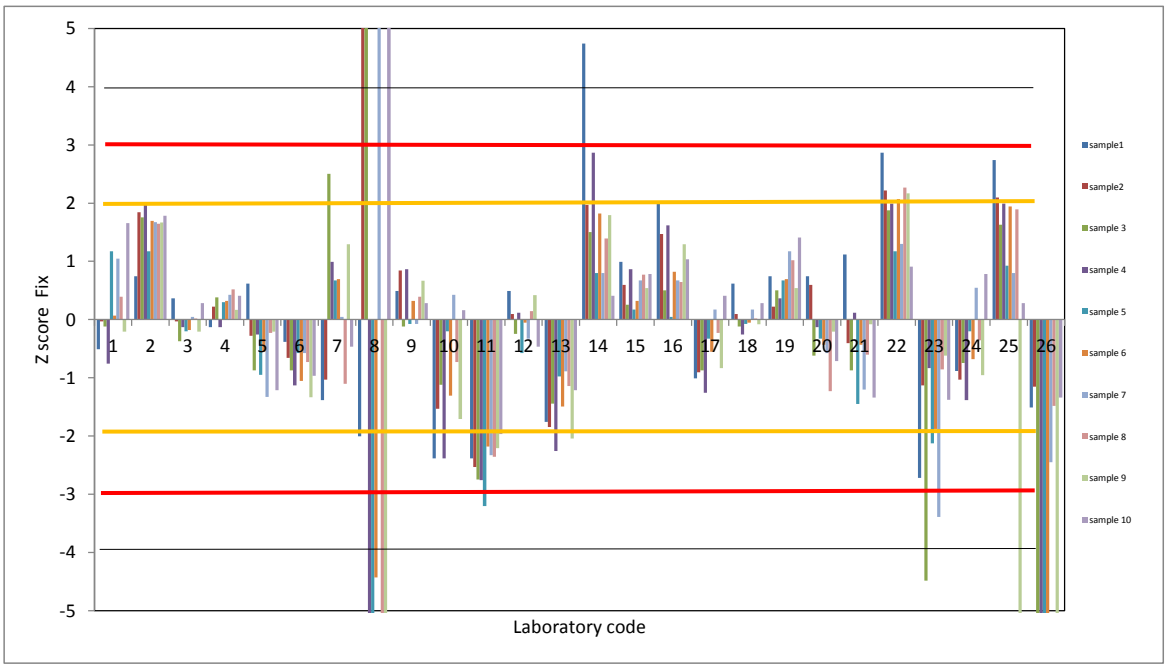
Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-0.51	-0.03	-0.12	-0.76	+1.17	+0.07	+1.05	+0.39	-0.21	+1.66
2	+0.74	+1.84	+1.75	+1.99	+1.17	+1.69	+1.67	+1.64	+1.67	+1.78
3	+0.37	-0.03	-0.37	-0.13	-0.20	-0.18	+0.05	+0.02	-0.21	+0.28
4	-0.13	+0.22	+0.38	-0.13	+0.30	+0.32	+0.42	+0.52	+0.17	+0.41
5	+0.62	-0.28	-0.87	-0.26	-0.95	-0.56	-1.33	-0.23	-0.21	-1.22
6	-0.38	-0.66	-0.87	-1.13	-0.58	-1.06	-0.58	-0.73	-1.33	-0.97
7	-1.38	-1.03	+2.50	+0.99	+0.67	+0.69	+0.05	-1.11	+1.29	-0.47
8	-2.01	+23.84	+32.13	-18.01	-16.58	-4.43	+25.67	-12.48	-36.96	+57.78
9	+0.49	+0.84	-0.12	+0.87	-0.08	+0.32	-0.08	+0.39	+0.67	+0.28
10	-2.38	-1.53	-1.12	-2.38	-0.20	-1.31	+0.42	-0.73	-1.71	+0.16
11	-2.38	-2.53	-2.75	-2.76	-3.20	-2.18	-2.33	-2.36	-2.21	-1.97
12	+0.49	+0.09	-0.25	+0.12	-0.58	-0.06	-0.33	+0.14	+0.42	-0.47
13	-1.76	-1.84	-1.45	-2.26	-0.98	-1.49	-0.89	-1.14	-2.04	-1.22
14	+4.74	+1.97	+1.50	+2.87	+0.80	+1.82	+0.80	+1.39	+1.79	+0.41
15	+0.99	+0.59	+0.25	+0.87	+0.17	+0.32	+0.67	+0.77	+0.54	+0.78
16	+1.99	+1.47	+0.50	+1.62	+0.05	+0.82	+0.67	+0.64	+1.29	+1.03
17	-1.01	-0.91	-0.87	-1.26	-0.33	-0.56	+0.17	-0.23	-0.83	+0.41
18	+0.62	+0.09	-0.12	-0.26	-0.08	-0.06	+0.17	+0.02	-0.08	+0.28
19	+0.74	+0.22	+0.50	+0.37	+0.67	+0.69	+1.17	+1.02	+0.54	+1.41
20	+0.74	+0.59	-0.62	-0.13	-0.33	-0.43	-0.58	-1.23	-0.21	-0.72
21	+1.12	-0.41	-0.87	+0.12	-1.45	-0.43	-1.20	-0.61	-0.08	-1.34
22	+2.87	+2.22	+1.88	+1.99	+1.17	+2.07	+1.30	+2.27	+2.17	+0.91
23	-2.72	-1.13	-4.48	-0.83	-2.13	-1.88	-3.39	-0.86	-0.62	-1.38
24	-0.88	-1.03	-0.75	-1.38	-0.20	-0.68	+0.55	-0.36	-0.96	+0.78
25	+2.74	+2.09	+1.63	+1.99	+0.92	+1.94	+0.80	+1.89	-23.21	+0.28
26	-1.51	-1.16	-14.12	-10.26	-5.45	-6.56	-2.45	-1.48	-11.71	-1.34

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=0,040 g/100 g

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



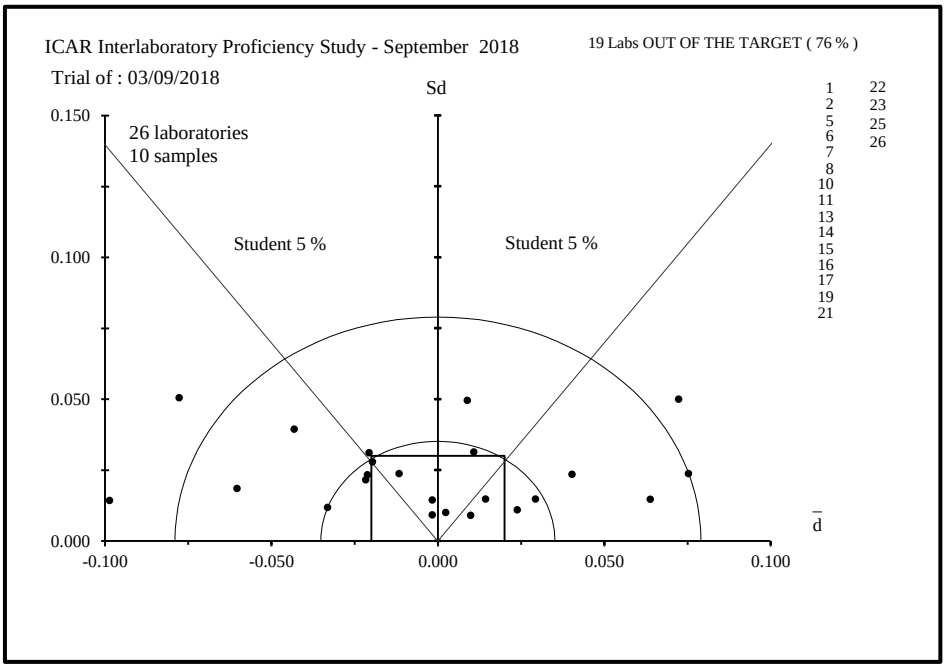


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK

Fat Routine method
September 2018

Name	City	Country
Artificial Insemination and Stock Breeding Station	Siguldas	Latvia
Cattle Information Service (CIS)	Teiford	England
Center for Green dairy Technology	HanKyong	Korea
Central Milk Lab ICBA	Caesarea	Israel
Dairy Cattle Research Center of Shandong Academy of Agricultural Sciences	Shandong	China
Direction de l' Amelioration Genetique DirectiondeAmeliorationGenetique	Sidi Thabet	Tunisie
Eastern Lab services	Medina	USA
Eurofins Steins Laboratory A/B	Jönköping	Sweden
Eurofins Steins Laboratory A/S	Vejen	Denmark
Laborator pro rozbor mléka Brno, Ceskomoravská spolecnost chovatelú a.s.	Brno	Czech Republic
Laboratorio Standard Latte	Maccarese (R	Italy
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Pruszkow	Poland
Merieux Nutriscience South Africa	Cape Town	South Africa
Merieux Nutriscience South Africa (Midrand)	Midrand	South Africa
Osuuskunta Satamaito, laboratorio	Pori	Finland
Plemenárske sluzby SR s.p.	Zilina	Slovakia
Shangai dairy breeding center Co.Ltd	Shanghai	China
Suisselab AG	Zullikofen	Switzerland
Taiwan Livestock research Insitute	Taiwan	Taiwan
Tine Ramelklaboratoriet Bergen	Bergen	Norvey
Tine Ramelklaboratoriet Heimdal	Heimdal	Norvey
Univ. of Ljubljana dept. of Animal Sc. Inst. of Dairy Sc. and Probiotics	Domzale	Slovenia
Valio Oy/Seinajoen aluelaboratorio	Seinajoki	Finland
Vetlab Agricultural Showgrouds	Lusaka	Zambia

ICAR
PROFICIENCY TESTING SCHEME

September 2018

Raw Milk

Determination of CRUDE PROTEIN CONTENT
Routine method

Sending date of statistical treatment : 18.10.2018

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

ACCRÉDITATION
N° 1-2473
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Table 1 : **Ranking of the laboratories** Units : g / 100 g

Nb	%	N°	Sig d	Sd	D	Method
1	4	19	- 0.004	0.004	0.006	IR
2	8	20	+ 0.000	0.013	0.013	IR
3	12	15	- 0.001	0.014	0.014	IR
4	15	25	+ 0.012	0.008	0.014	IR
5	19	14	+ 0.014	0.013	0.019	IR
6	23	2	+ 0.019	0.003	0.019	IR
7	27	5	- 0.020	0.012	0.023	IR
8	31	13	+ 0.002	0.023	0.023	IR
9	35	17	+ 0.024	0.008	0.025	IR
10	38	22	- 0.016	0.020	0.026	IR
11	42	21	+ 0.026	0.017	0.030	IR
12	46	6	+ 0.024	0.021	0.032	IR
13	50	18	+ 0.033	0.006	0.033	IR
14	54	26	- 0.028	0.018	0.033	IR
15	58	7	- 0.036	0.007	0.037	IR
16	62	24	- 0.040	0.009	0.042	IR
17	65	3	+ 0.040	0.016	0.043	IR
18	69	10	- 0.042	0.008	0.043	IR
19	73	23	+ 0.051	0.011	0.052	IR
20	77	11	- 0.054	0.019	0.057	IR
21	81	4	- 0.055	0.023	0.060	IR
22	85	16	+ 0.058	0.016	0.060	IR
23	88	12	+ 0.053	0.034	0.063	IR
24	92	9	- 0.137	0.037	0.142	IR
25	96	1	- 0.164	0.022	0.165	IR
26	100	8	- 0.018	0.557	0.557	IR

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 :

$\pm$ 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 26 sets of results send by 26 laboratories using routine method ISO 9622|IDF 141, 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}	0.005
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0.044

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	0.010	0.000	0.010	0.000	0.010	0.000	0.010	0.000	0.010	0.000	0.005	20
2	0.000	0.010	0.010	0.000	0.000	0.000	0.000	0.010	0.010	0.010	0.005	20
3	0.010	0.000	0.010	0.010	0.000	0.010	0.010	0.010	0.010	0.000	0.006	20
4	0.030	0.000	0.000	0.010	0.000	0.010	0.010	0.010	0.000	0.000	0.008	20
5	0.000	0.010	0.000	0.010	0.000	0.010	0.010	0.000	0.020	0.010	0.007	20
6	0.020	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.007	20
7	0.010	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.003	20
8	0.010	0.010	0.000	0.010	0.010	0.000	0.010	0.000	0.000	0.010	0.005	20
9	0.010	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.010	0.000	0.004	20
10	0.010	0.010	0.010	0.010	0.010	0.000	0.000	0.000	0.010	0.000	0.005	20
11	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.000	0.020	0.000	0.007	20
12	0.000	0.010	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.010	0.004	20
13	0.000	0.005	0.000	0.001	0.003	0.001	0.003	0.003	0.004	0.001	0.002	20
14	0.000	0.010	0.000	0.010	0.000	0.000	0.000	0.010	0.000	0.010	0.004	20
15	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.004	20
16	0.020	0.000	0.010	0.010	0.000	0.000	0.010	0.010	0.000	0.000	0.006	20
17	0.010	0.000	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.000	0.006	20
18	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.010	0.003	20
19	0.000	0.000	0.000	0.000	0.010	0.010	0.010	0.000	0.010	0.000	0.004	20
20	0.000	0.000	0.010	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.004	20
21	0.110 *	0.000	0.010	0.010	0.020 *	0.030 *	0.010	0.000	0.010	0.020	0.027	20
22	0.000	0.000	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.003	20
23	0.010	0.016	0.008	0.002	0.005	0.008	0.006	0.006	0.009	0.009	0.006	20
24	0.020	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.010	0.000	0.005	20
25	0.010	0.000	0.010	0.010	0.000	0.000	0.000	0.010	0.010	0.000	0.005	20
26	0.010	0.010	0.000	0.010	0.000	0.000	0.000	0.000	0.010	0.010	0.005	20
Sr	0.017	0.005	0.005	0.005	0.004	0.006	0.005	0.004	0.007	0.005		520
NE	52	52	52	52	52	52	52	52	52	52		
L	0.033	0.020	0.021	0.021	0.015	0.017	0.021	0.017	0.028	0.020		

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 according ISO 9622|IDF 141

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	3.575 *	3.110 *	2.735	3.390 *	2.545	3.260 *	2.685	2.920	3.475 *	3.120 *
2	3.790	3.295	2.895	3.590	2.700	3.460	2.830	3.095	3.685	3.305
3	3.785	3.310	2.935	3.585	2.740	3.475	2.865	3.135	3.695	3.330
4	3.745	3.220	2.810	3.535	2.590	3.395	2.735	3.015	3.640	3.220
5	3.730	3.255	2.870	3.545	2.680	3.415	2.805	3.060	3.630	3.265
6	3.770	3.295	2.925	3.580	2.740	3.450	2.860	3.110	3.660	3.300
7	3.725	3.240	2.850	3.530	2.660	3.395	2.780	3.040	3.630	3.240
8	3.845	3.655 *	3.600 *	3.275 *	3.285 *	3.080 *	2.865	2.700 *	2.500 *	3.465 *
9	3.595 *	3.150	2.780	3.420 *	2.610	3.270 *	2.705	2.930	3.475 *	3.150 *
10	3.735	3.235	2.835	3.535	2.635	3.400	2.760	3.030	3.635	3.230
11	3.675	3.205	2.815	3.505	2.625	3.395	2.775	3.030	3.630	3.260
12	3.770	3.325	2.960	3.590	2.780	3.470	2.915	3.150	3.690	3.335
13	3.802	3.277	2.858	3.599	2.657	3.452	2.789	3.072	3.695	3.280
14	3.760	3.275	2.900	3.565	2.710	3.450	2.840	3.105	3.680	3.305
15	3.750	3.270	2.895	3.560	2.700	3.430	2.830	3.080	3.645	3.285
16	3.800	3.350	2.955	3.625	2.750	3.490	2.875	3.145	3.720	3.320
17	3.795	3.300	2.905	3.595	2.695	3.475	2.825	3.105	3.695	3.300
18	3.810	3.300	2.910	3.605	2.710	3.470	2.840	3.110	3.710	3.315
19	3.760	3.270	2.880	3.560	2.675	3.435	2.805	3.080	3.665	3.280
20	3.790	3.270	2.875	3.580	2.670	3.450	2.795	3.075	3.680	3.270
21	3.825	3.280	2.915	3.585	2.730	3.455	2.845	3.100	3.675	3.300
22	3.710	3.250	2.875	3.535	2.690	3.420	2.820	3.080	3.640	3.270
23	3.806	3.321	2.945	3.609	2.748	3.480	2.877	3.132	3.713	3.333
24	3.720	3.230	2.850	3.520	2.660	3.395	2.780	3.040	3.615	3.240
25	3.765	3.280	2.895	3.575	2.700	3.450	2.840	3.095	3.675	3.300
26	3.755	3.245	2.850	3.565	2.630	3.420	2.760	3.040	3.665	3.245
M	3.767	3.269	2.877	3.568	2.681	3.440	2.812	3.071	3.668	3.284
REF.	3.768	3.271	2.880	3.569	2.683	3.440	2.814	3.077	3.668	3.284
SD	0.040	0.043	0.054	0.031	0.055	0.031	0.055	0.057	0.030	0.034

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 26 laboratories using the Routine method ISO 9622 | IDF 141, after outliers discargingd using Grubbs test at 5 % risk level.

Table IV : Outliers identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran	21				21	21				
Outliers Grubbs	1; 9	1; 8	8	1; 8; 9	8	1; 8; 9		8	1; 8; 9	1; 8; 9
Sr	0.008	0.005	0.005	0.005	0.003	0.004	0.005	0.004	0.007	0.005
SR	0.039	0.043	0.054	0.031	0.055	0.031	0.055	0.058	0.031	0.034

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	- 0.193	- 0.161	- 0.145	- 0.179	- 0.138	- 0.180	- 0.129	- 0.157	- 0.193	- 0.164	- 0.164	0.022	23.19
2	+ 0.022	+ 0.024	+ 0.015	+ 0.021	+ 0.017	+ 0.020	+ 0.016	+ 0.018	+ 0.017	+ 0.021	+ 0.019	0.003	19.77
3	+ 0.017	+ 0.039	+ 0.055	+ 0.016	+ 0.057	+ 0.035	+ 0.051	+ 0.058	+ 0.027	+ 0.046	+ 0.040	0.016	7.97
4	- 0.023	- 0.051	- 0.070	- 0.034	- 0.093	- 0.045	- 0.079	- 0.062	- 0.028	- 0.064	- 0.055	0.023	7.60
5	- 0.038	- 0.016	- 0.010	- 0.024	- 0.003	- 0.025	- 0.009	- 0.017	- 0.038	- 0.019	- 0.020	0.012	5.39
6	+ 0.002	+ 0.024	+ 0.045	+ 0.011	+ 0.057	+ 0.010	+ 0.046	+ 0.033	- 0.008	+ 0.016	+ 0.024	0.021	3.52
7	- 0.043	- 0.031	- 0.030	- 0.039	- 0.023	- 0.045	- 0.034	- 0.037	- 0.038	- 0.044	- 0.036	0.007	16.40
8	+ 0.077	+ 0.384	+ 0.720	- 0.294	+ 0.602	- 0.360	+ 0.051	- 0.377	- 1.168	+ 0.181	- 0.018	0.557	0.10
9	- 0.173	- 0.121	- 0.100	- 0.149	- 0.073	- 0.170	- 0.109	- 0.147	- 0.193	- 0.134	- 0.137	0.037	11.71
10	- 0.033	- 0.036	- 0.045	- 0.034	- 0.048	- 0.040	- 0.054	- 0.047	- 0.033	- 0.054	- 0.042	0.008	16.05
11	- 0.093	- 0.066	- 0.065	- 0.064	- 0.058	- 0.045	- 0.039	- 0.047	- 0.038	- 0.024	- 0.054	0.019	8.78
12	+ 0.002	+ 0.054	+ 0.080	+ 0.021	+ 0.097	+ 0.030	+ 0.101	+ 0.073	+ 0.022	+ 0.051	+ 0.053	0.034	4.91
13	+ 0.034	+ 0.006	- 0.022	+ 0.030	- 0.027	+ 0.011	- 0.025	- 0.006	+ 0.027	- 0.005	+ 0.002	0.023	0.32
14	- 0.008	+ 0.004	+ 0.020	- 0.004	+ 0.027	+ 0.010	+ 0.026	+ 0.028	+ 0.012	+ 0.021	+ 0.014	0.013	3.32
15	- 0.018	- 0.001	+ 0.015	- 0.009	+ 0.017	- 0.010	+ 0.016	+ 0.003	- 0.023	+ 0.001	- 0.001	0.014	0.21
16	+ 0.032	+ 0.079	+ 0.075	+ 0.056	+ 0.067	+ 0.050	+ 0.061	+ 0.068	+ 0.052	+ 0.036	+ 0.058	0.016	11.64
17	+ 0.027	+ 0.029	+ 0.025	+ 0.026	+ 0.012	+ 0.035	+ 0.011	+ 0.028	+ 0.027	+ 0.016	+ 0.024	0.008	9.47
18	+ 0.042	+ 0.029	+ 0.030	+ 0.036	+ 0.027	+ 0.030	+ 0.026	+ 0.033	+ 0.042	+ 0.031	+ 0.033	0.006	18.18
19	- 0.008	- 0.001	- 0.000	- 0.009	- 0.008	- 0.005	- 0.009	+ 0.003	- 0.003	- 0.004	- 0.004	0.004	3.42
20	+ 0.022	- 0.001	- 0.005	+ 0.011	- 0.013	+ 0.010	- 0.019	- 0.002	+ 0.012	- 0.014	+ 0.000	0.013	0.01
21	+ 0.057	+ 0.009	+ 0.035	+ 0.016	+ 0.047	+ 0.015	+ 0.031	+ 0.023	+ 0.007	+ 0.016	+ 0.026	0.017	4.88
22	- 0.058	- 0.021	- 0.005	- 0.034	+ 0.007	- 0.020	+ 0.006	+ 0.003	- 0.028	- 0.014	- 0.016	0.020	2.55
23	+ 0.038	+ 0.050	+ 0.065	+ 0.040	+ 0.064	+ 0.040	+ 0.063	+ 0.055	+ 0.044	+ 0.048	+ 0.051	0.011	15.28
24	- 0.048	- 0.041	- 0.030	- 0.049	- 0.023	- 0.045	- 0.034	- 0.037	- 0.053	- 0.044	- 0.040	0.009	13.72
25	- 0.003	+ 0.009	+ 0.015	+ 0.006	+ 0.017	+ 0.010	+ 0.026	+ 0.018	+ 0.007	+ 0.016	+ 0.012	0.008	4.75
26	- 0.013	- 0.026	- 0.030	- 0.004	- 0.053	- 0.020	- 0.054	- 0.037	- 0.003	- 0.039	- 0.028	0.018	4.83
d	- 0.001	- 0.002	- 0.003	- 0.000	- 0.002	- 0.000	- 0.002	- 0.006	- 0.000	- 0.000	- 0.010	0.117	
Sd	0.040	0.043	0.054	0.031	0.055	0.031	0.055	0.057	0.030	0.034	0.044		

d = mean of differences Sd_{lab} = 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 9622|IDF141 : Precision of the method : Sr = 0.014 g / 100 g
SR = 0,04 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	-4.85	-3.71	-2.68	-5.72	-2.51	-5.87	-2.36	-2.74	-6.38	-4.87
2	+0.55	+0.56	+0.27	+0.68	+0.30	+0.64	+0.30	+0.31	+0.55	+0.62
3	+0.42	+0.91	+1.01	+0.52	+1.03	+1.13	+0.94	+1.00	+0.88	+1.36
4	-0.58	-1.17	-1.30	-1.08	-1.69	-1.47	-1.44	-1.08	-0.93	-1.90
5	-0.96	-0.36	-0.19	-0.76	-0.06	-0.82	-0.16	-0.30	-1.26	-0.57
6	+0.05	+0.56	+0.83	+0.36	+1.03	+0.32	+0.85	+0.57	-0.27	+0.47
7	-1.08	-0.71	-0.56	-1.24	-0.42	-1.47	-0.62	-0.65	-1.26	-1.31
8	+1.93	+8.89	+13.29	-9.40	+10.93	-11.73	+0.94	-6.56	-38.55	+5.37
9	-4.35	-2.79	-1.85	-4.76	-1.33	-5.54	-1.99	-2.56	-6.38	-3.98
10	-0.83	-0.82	-0.83	-1.08	-0.88	-1.31	-0.99	-0.82	-1.10	-1.61
11	-2.34	-1.52	-1.20	-2.04	-1.06	-1.47	-0.71	-0.82	-1.26	-0.72
12	+0.05	+1.26	+1.47	+0.68	+1.76	+0.97	+1.86	+1.27	+0.72	+1.51
13	+0.85	+0.14	-0.41	+0.95	-0.49	+0.37	-0.46	-0.10	+0.88	-0.14
14	-0.20	+0.10	+0.37	-0.12	+0.49	+0.32	+0.48	+0.48	+0.39	+0.62
15	-0.45	-0.01	+0.27	-0.28	+0.30	-0.33	+0.30	+0.05	-0.77	+0.03
16	+0.80	+1.84	+1.38	+1.80	+1.21	+1.62	+1.12	+1.18	+1.71	+1.06
17	+0.68	+0.68	+0.46	+0.84	+0.21	+1.13	+0.21	+0.48	+0.88	+0.47
18	+1.05	+0.68	+0.55	+1.16	+0.49	+0.97	+0.48	+0.57	+1.38	+0.92
19	-0.20	-0.01	-0.00	-0.28	-0.15	-0.17	-0.16	+0.05	-0.11	-0.12
20	+0.55	-0.01	-0.10	+0.36	-0.24	+0.32	-0.34	-0.04	+0.39	-0.42
21	+1.43	+0.22	+0.64	+0.52	+0.85	+0.48	+0.57	+0.40	+0.22	+0.47
22	-1.46	-0.48	-0.10	-1.08	+0.12	-0.66	+0.11	+0.05	-0.93	-0.42
23	+0.95	+1.17	+1.20	+1.29	+1.17	+1.29	+1.16	+0.95	+1.46	+1.43
24	-1.21	-0.94	-0.56	-1.56	-0.42	-1.47	-0.62	-0.65	-1.76	-1.31
25	-0.08	+0.22	+0.27	+0.20	+0.30	+0.32	+0.48	+0.31	+0.22	+0.47
26	-0.33	-0.59	-0.56	-0.12	-0.97	-0.66	-0.99	-0.65	-0.11	-1.16

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

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

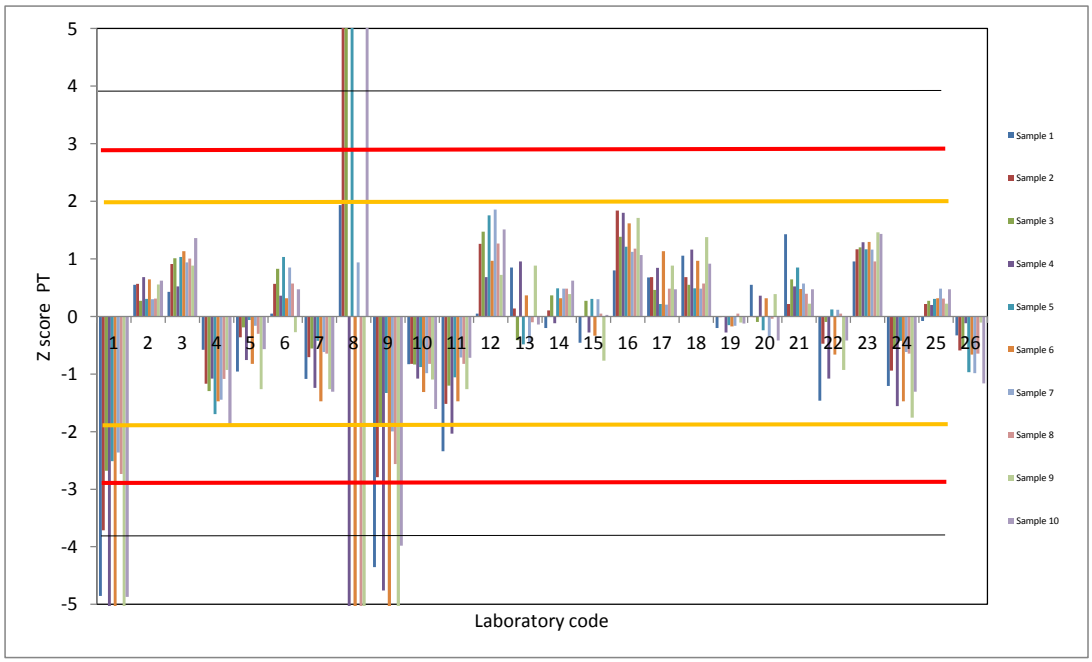


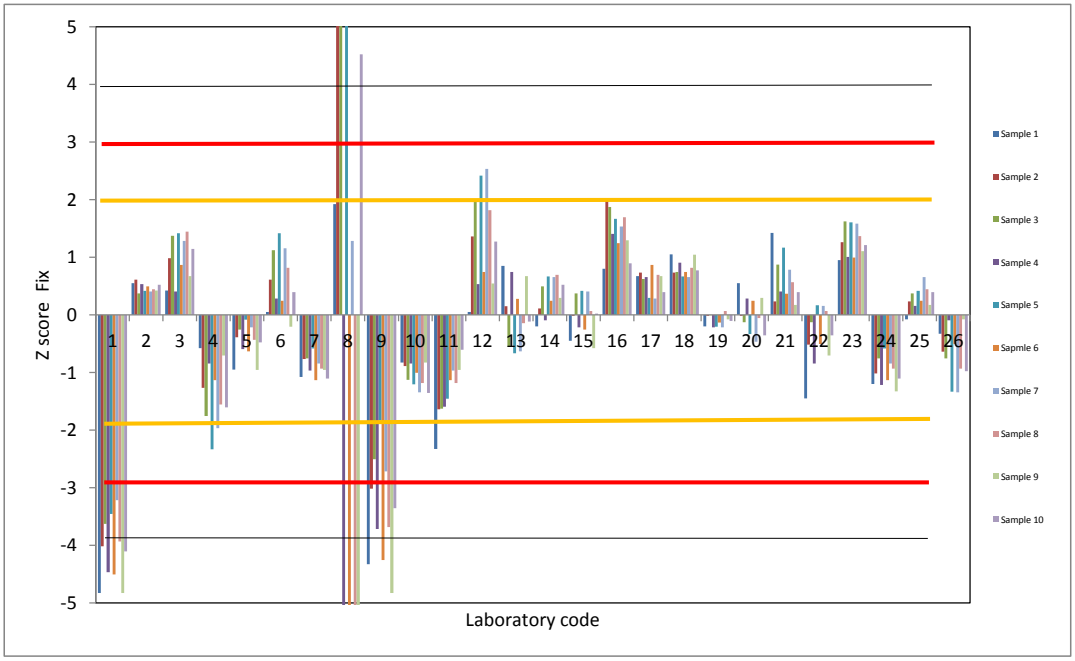
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-4.83	-4.01	-3.63	-4.47	-3.46	-4.51	-3.22	-3.93	-4.83	-4.10
2	+0.55	+0.61	+0.37	+0.53	+0.42	+0.49	+0.41	+0.44	+0.42	+0.52
3	+0.42	+0.99	+1.37	+0.41	+1.42	+0.87	+1.28	+1.44	+0.67	+1.15
4	-0.58	-1.26	-1.75	-0.84	-2.33	-1.13	-1.97	-1.56	-0.71	-1.60
5	-0.95	-0.39	-0.25	-0.59	-0.08	-0.63	-0.22	-0.43	-0.96	-0.48
6	+0.05	+0.61	+1.12	+0.28	+1.42	+0.24	+1.16	+0.82	-0.21	+0.40
7	-1.08	-0.76	-0.75	-0.97	-0.58	-1.13	-0.84	-0.93	-0.96	-1.10
8	+1.92	+9.61	+18.00	-7.34	+15.04	-9.01	+1.28	-9.43	-29.21	+4.52
9	-4.33	-3.01	-2.50	-3.72	-1.83	-4.26	-2.72	-3.68	-4.83	-3.35
10	-0.83	-0.89	-1.13	-0.84	-1.21	-1.01	-1.34	-1.18	-0.83	-1.35
11	-2.33	-1.64	-1.63	-1.59	-1.46	-1.13	-0.97	-1.18	-0.96	-0.60
12	+0.05	+1.36	+2.00	+0.53	+2.42	+0.74	+2.53	+1.82	+0.54	+1.27
13	+0.85	+0.15	-0.55	+0.75	-0.67	+0.28	-0.63	-0.14	+0.67	-0.12
14	-0.20	+0.11	+0.50	-0.09	+0.67	+0.24	+0.66	+0.69	+0.29	+0.52
15	-0.45	-0.01	+0.37	-0.22	+0.42	-0.26	+0.41	+0.07	-0.58	+0.02
16	+0.80	+1.99	+1.87	+1.41	+1.67	+1.24	+1.53	+1.69	+1.29	+0.90
17	+0.67	+0.74	+0.62	+0.66	+0.29	+0.87	+0.28	+0.69	+0.67	+0.40
18	+1.05	+0.74	+0.75	+0.91	+0.67	+0.74	+0.66	+0.82	+1.04	+0.77
19	-0.20	-0.01	-0.00	-0.22	-0.21	-0.13	-0.22	+0.07	-0.08	-0.10
20	+0.55	-0.01	-0.13	+0.28	-0.33	+0.24	-0.47	-0.06	+0.29	-0.35
21	+1.42	+0.24	+0.87	+0.41	+1.17	+0.37	+0.78	+0.57	+0.17	+0.40
22	-1.45	-0.51	-0.13	-0.84	+0.17	-0.51	+0.16	+0.07	-0.71	-0.35
23	+0.95	+1.26	+1.62	+1.01	+1.61	+0.99	+1.58	+1.37	+1.11	+1.21
24	-1.20	-1.01	-0.75	-1.22	-0.58	-1.13	-0.84	-0.93	-1.33	-1.10
25	-0.08	+0.24	+0.37	+0.16	+0.42	+0.24	+0.66	+0.44	+0.17	+0.40
26	-0.33	-0.64	-0.75	-0.09	-1.33	-0.51	-1.34	-0.93	-0.08	-0.98

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation has always the value of SR of the method SR=0,040 g/100 g

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



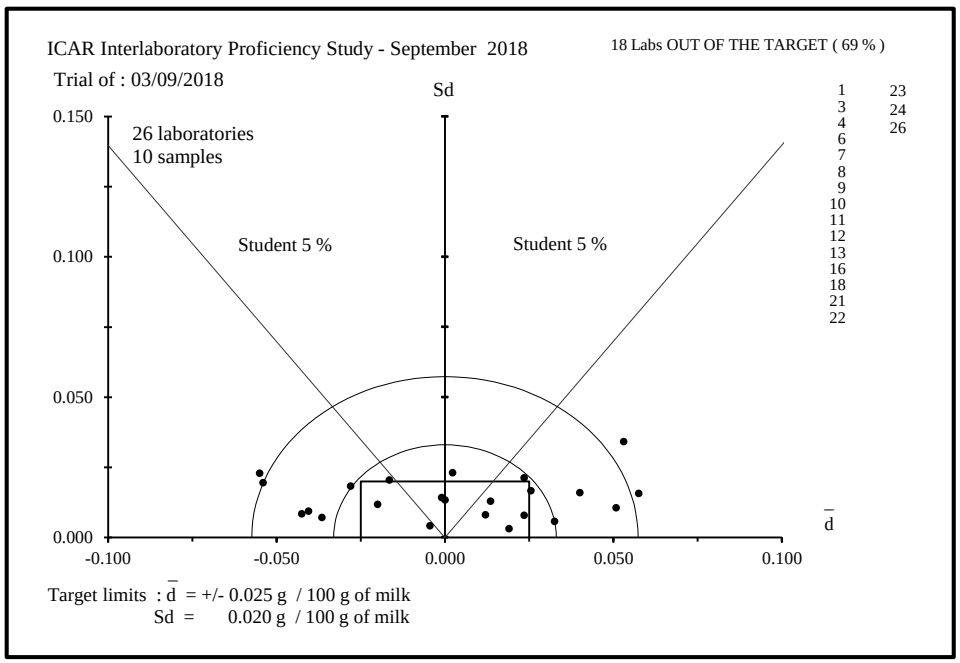


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST

RAW MILK

Protein Routine method
September 2018

Name	City	Country
Artificial Insemination and Stock Breeding Station	Siguldas	Latvia
Cattle Information Service (CIS)	Teiford	England
Center for Green dairy Technology	HanKyong	Korea
Central Milk Lab ICBA	Caesarea	Israel
Dairy Cattle Research Center of Shandong Academy of Agricultural Sciences	Shandong	China
Direction de l' Amelioration Genetique DirectiondeAmeliorationGenetique	Sidi Thabet	Tunisie
Eastern Lab services	Medina	USA
Eurofins Steins Laboratory A/B	Jönköping	Sweden
Eurofins Steins Laboratory A/S	Vejen	Denmark
Laborator pro rozbor mléka Brno, Ceskomoravská spolecnost chovatelú a.s.	Brno	Czech Republic
Laboratorio Standard Latte	Maccarese (R	Italy
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Pruszkow	Poland
Merieux Nutriscience South Africa	Cape Town	South Africa
Merieux Nutriscience South Africa (Midrand)	Midrand	South Africa
Osuuskunta Satamaito, laboratorio	Pori	Finland
Plemenárske sluzby SR s.p.	Zilina	Slovakia
Shangai dairy breeding center Co.Ltd	Shanghai	China
Suisselab AG	Zullikofen	Switzerland
Taiwan Livestock research Insitute	Taiwan	Taiwan
Tine Ramelklaboratoriet Bergen	Bergen	Norvey
Tine Ramelklaboratoriet Heimdal	Heimdal	Norvey
Univ. of Ljubljana dept. of Animal Sc. Inst. of Dairy Sc. and Probiotics	Domzale	Slovenia
Valio Oy/Seinajoen aluelaboratorio	Seinajoki	Finland
Vetlab Agricultural Showgrouds	Lusaka	Zambia

ICAR
PROFICIENCY TESTING SCHEME

September 2018

Raw Milk

Determination of LACTOSE CONTENT
Routine method

Sending date of statistical treatment : 18.10.2018

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

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

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

Nb	%	N°	sig d	Sd	D
1	4	13	+ 0.004	0.010	0.011
2	9	11	- 0.009	0.014	0.016
3	13	14	+ 0.016	0.013	0.021
4	17	19	- 0.022	0.009	0.024
5	22	3	+ 0.019	0.015	0.024
6	26	4	- 0.023	0.007	0.024
7	30	5	+ 0.023	0.015	0.027
8	35	21	+ 0.021	0.020	0.029
9	39	23	- 0.017	0.024	0.029
10	43	8	+ 0.031	0.006	0.032
11	48	16	- 0.023	0.024	0.033
12	52	1	- 0.022	0.027	0.035
13	57	20	- 0.028	0.040	0.049
14	61	22	- 0.031	0.038	0.049
15	65	10	+ 0.054	0.007	0.054
16	70	6	- 0.056	0.011	0.057
17	74	9	+ 0.057	0.029	0.064
18	78	7	- 0.077	0.007	0.077
19	83	12	+ 0.077	0.009	0.078
20	87	17	- 0.078	0.028	0.082
21	91	18	+ 0.135	0.005	0.135
22	96	15	- 0.258	0.010	0.258
23	100	2	- 0.204	0.287	0.352

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 :

$$\pm 0.100 \text{ g / 100 g for } \bar{d} \text{ and } 0.100 \text{ g / 100g for Sd}$$

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 22 sets of results send by 23 laboratories using routine method ISO 9622|IDF 141, 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}	0.006
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0.054

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0.000	0.000	0.010	0.020	0.020	0.010	0.020	0.020	0.050 *	0.020	0.015	20
2	0.020	0.010	0.000	0.010	0.010	0.010	0.020	0.010	0.000	0.010	0.008	20
3	0.010	0.000	0.010	0.000	0.010	0.000	0.010	0.010	0.010	0.010	0.006	20
4	0.021	0.011	0.000	0.011	0.000	0.011	0.011	0.011	0.011	0.011	0.008	20
5	0.010	0.010	0.010	0.000	0.000	0.020	0.000	0.020	0.000	0.000	0.007	20
6	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.005	20
7	0.010	0.010	0.000	0.010	0.000	0.000	0.010	0.000	0.000	0.000	0.004	20
8	0.010	0.000	0.000	0.010	0.010	0.010	0.000	0.010	0.010	0.000	0.005	20
9	0.054 *	0.010	0.000	0.000	0.010	0.010	0.000	0.000	0.010	0.010	0.013	20
10	0.000	0.000	0.000	0.010	0.000	0.010	0.010	0.000	0.010	0.010	0.005	20
11	0.002	0.004	0.000	0.001	0.008	0.005	0.000	0.001	0.001	0.002	0.002	20
12	**	**	**	**	**	**	**	**	**	**		
13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	20
14	0.000	0.010	0.000	0.010	0.010	0.010	0.010	0.010	0.010	0.000	0.006	20
15	0.010	0.010	0.010	0.000	0.010	0.010	0.010	0.000	0.000	0.020	0.007	20
16	0.010	0.000	0.020	0.000	0.010	0.040 *	0.000	0.010	0.040 *	0.030 *	0.015	20
17	0.000	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.000	0.006	20
18	0.010	0.000	0.010	0.000	0.010	0.000	0.000	0.000	0.010	0.000	0.004	20
19	0.020	0.010	0.000	0.000	0.000	0.000	0.010	0.000	0.010	0.000	0.006	20
20	0.000	0.000	0.000	0.010	0.000	0.000	0.010	0.000	0.000	0.000	0.003	20
21	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.002	20
22	0.000	0.000	0.010	0.000	0.010	0.010	0.000	0.010	0.010	0.000	0.005	20
23	0.020	0.000	0.010	0.000	0.010	0.010	0.010	0.010	0.010	0.000	0.007	20
Sr	0.011	0.005	0.005	0.005	0.006	0.009	0.006	0.006	0.011	0.007		440
NE	44	44	44	44	44	44	44	44	44	44		
L	0.032	0.018	0.021	0.021	0.024	0.025	0.026	0.025	0.021	0.023		

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 according ISO 9622|IDF 141

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	5.030	4.980	4.905	4.750	4.620	4.715	4.660	4.620	4.605	4.830
2	4.370 *	4.485 *	4.530 *	4.445 *	4.625	4.575	4.840	4.645	4.530	4.855
3	5.135	5.060	4.975	4.790	4.625	4.750	4.685	4.635	4.585	4.885
4	5.060	5.002	4.934	4.750	4.629	4.697	4.645	4.603	4.550	4.834
5	5.145	5.065	4.985	4.790	4.660	4.740	4.680	4.630	4.580	4.890
6	5.020	4.980	4.900	4.720	4.590	4.670	4.600	4.570	4.510	4.815
7	5.015	4.935	4.870	4.695	4.570	4.650	4.595	4.550	4.500	4.790
8	5.125	5.050	4.980	4.805	4.685	4.755	4.700	4.655	4.605	4.890
9	5.183	5.125	5.040	4.830	4.655	4.775	4.710	4.660	4.595	4.935
10	5.150	5.080	5.020	4.815	4.680	4.775	4.725	4.680	4.625	4.925
11	5.113	5.025	4.951	4.758	4.636	4.706	4.649	4.600	4.549	4.863
12	5.170	5.110	5.040	4.840	4.700	4.800	4.740	4.710	4.650	4.950
13	5.120	5.030	4.960	4.770	4.650	4.730	4.660	4.620	4.570	4.870
14	5.110	5.035	4.960	4.775	4.635	4.745	4.695	4.655	4.615	4.870
15	4.825 *	4.755 *	4.685 *	4.510 *	4.395 *	4.465 *	4.415 *	4.380 *	4.330 *	4.600 *
16	5.085	5.000	4.930	4.730	4.635	4.680	4.610	4.645	4.530	4.865
17	5.060	4.985	4.895	4.685	4.555	4.635	4.565	4.515	4.465	4.800
18	5.235	5.170	5.095	4.900	4.775 *	4.850	4.800	4.760	4.705	5.000
19	5.070	5.015	4.930	4.750	4.630	4.700	4.635	4.590	4.555	4.840
20	5.000	4.950	4.890	4.745	4.660	4.710	4.665	4.630	4.590	4.820
21	5.150	5.070	4.990	4.790	4.650	4.735	4.670	4.630	4.570	4.890
22	5.000	4.950	4.885	4.740	4.655	4.705	4.660	4.625	4.585	4.820
23	5.090	4.970	4.925	4.740	4.635	4.705	4.695	4.605	4.585	4.820
M	5.098	5.028	4.955	4.770	4.637	4.718	4.677	4.629	4.575	4.866
REF.	5.097	5.025	4.953	4.767	4.640	4.719	4.672	4.628	4.574	4.863
SD	0.064	0.062	0.059	0.050	0.035	0.058	0.063	0.052	0.052	0.052

M = mean per sample REF. = reference values

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 22 laboratories using the Routine method ISO 9622 | IDF 141 , after outliers discarging using Grubbs test at 5 % risk level.

Table IV : Outliers identification

Sample	1	2	3	4	5	6	7	8	9	10
Outliers Cochran	9					16			1; 16	16
Outliers Grubbs	2; 15	2; 15	2; 15	2; 15	15; 18	15	15	15	15	15
Sr	0.008	0.004	0.005	0.005	0.006	0.006	0.006	0.006	0.005	0.005
SR	0.062	0.060	0.057	0.049	0.033	0.058	0.064	0.050	0.052	0.052

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	- 0.067	- 0.045	- 0.048	- 0.017	- 0.020	- 0.004	- 0.012	- 0.008	+ 0.031	- 0.033	- 0.022	0.027	2.56
2	- 0.727	- 0.540	- 0.423	- 0.322	- 0.015	- 0.144	+ 0.168	+ 0.017	- 0.044	- 0.008	- 0.204	0.287	2.25
3	+ 0.038	+ 0.035	+ 0.022	+ 0.023	- 0.015	+ 0.031	+ 0.013	+ 0.007	+ 0.011	+ 0.022	+ 0.019	0.015	3.84
4	- 0.037	- 0.023	- 0.019	- 0.018	- 0.011	- 0.022	- 0.027	- 0.025	- 0.024	- 0.029	- 0.023	0.007	10.61
5	+ 0.048	+ 0.040	+ 0.032	+ 0.023	+ 0.020	+ 0.021	+ 0.008	+ 0.002	+ 0.006	+ 0.027	+ 0.023	0.015	4.89
6	- 0.077	- 0.045	- 0.053	- 0.047	- 0.050	- 0.049	- 0.072	- 0.058	- 0.064	- 0.048	- 0.056	0.011	16.18
7	- 0.082	- 0.090	- 0.083	- 0.072	- 0.070	- 0.069	- 0.077	- 0.078	- 0.074	- 0.073	- 0.077	0.007	36.34
8	+ 0.028	+ 0.025	+ 0.027	+ 0.038	+ 0.045	+ 0.036	+ 0.028	+ 0.027	+ 0.031	+ 0.027	+ 0.031	0.006	15.28
9	+ 0.086	+ 0.100	+ 0.087	+ 0.063	+ 0.015	+ 0.056	+ 0.038	+ 0.032	+ 0.021	+ 0.072	+ 0.057	0.029	6.12
10	+ 0.053	+ 0.055	+ 0.067	+ 0.048	+ 0.040	+ 0.056	+ 0.053	+ 0.052	+ 0.051	+ 0.062	+ 0.054	0.007	23.32
11	+ 0.016	- 0.000	- 0.002	- 0.010	- 0.004	- 0.014	- 0.023	- 0.028	- 0.026	- 0.000	- 0.009	0.014	2.05
12	+ 0.073	+ 0.085	+ 0.087	+ 0.073	+ 0.060	+ 0.081	+ 0.068	+ 0.082	+ 0.076	+ 0.087	+ 0.077	0.009	27.98
13	+ 0.023	+ 0.005	+ 0.007	+ 0.003	+ 0.010	+ 0.011	- 0.012	- 0.008	- 0.004	+ 0.007	+ 0.004	0.010	1.32
14	+ 0.013	+ 0.010	+ 0.007	+ 0.008	- 0.005	+ 0.026	+ 0.023	+ 0.027	+ 0.041	+ 0.007	+ 0.016	0.013	3.73
15	- 0.272	- 0.270	- 0.268	- 0.257	- 0.245	- 0.254	- 0.257	- 0.248	- 0.244	- 0.263	- 0.258	0.010	78.63
16	- 0.012	- 0.025	- 0.023	- 0.037	- 0.005	- 0.039	- 0.062	+ 0.017	- 0.044	+ 0.002	- 0.023	0.024	3.01
17	- 0.037	- 0.040	- 0.058	- 0.082	- 0.085	- 0.084	- 0.107	- 0.113	- 0.109	- 0.063	- 0.078	0.028	8.93
18	+ 0.138	+ 0.145	+ 0.142	+ 0.133	+ 0.135	+ 0.131	+ 0.128	+ 0.132	+ 0.131	+ 0.137	+ 0.135	0.005	81.82
19	- 0.027	- 0.010	- 0.023	- 0.017	- 0.010	- 0.019	- 0.037	- 0.038	- 0.019	- 0.023	- 0.022	0.009	7.43
20	- 0.097	- 0.075	- 0.063	- 0.022	+ 0.020	- 0.009	- 0.007	+ 0.002	+ 0.016	- 0.043	- 0.028	0.040	2.19
21	+ 0.053	+ 0.045	+ 0.037	+ 0.023	+ 0.010	+ 0.016	- 0.002	+ 0.002	- 0.004	+ 0.027	+ 0.021	0.020	3.32
22	- 0.097	- 0.075	- 0.068	- 0.027	+ 0.015	- 0.014	- 0.012	- 0.003	+ 0.011	- 0.043	- 0.031	0.038	2.58
23	- 0.007	- 0.055	- 0.028	- 0.027	- 0.005	- 0.014	+ 0.023	- 0.023	+ 0.011	- 0.043	- 0.017	0.024	2.23
d	+ 0.002	+ 0.002	+ 0.002	+ 0.002	- 0.002	- 0.001	+ 0.005	+ 0.001	+ 0.001	+ 0.003	- 0.018	0.101	
Sd	0.064	0.062	0.059	0.050	0.035	0.058	0.063	0.052	0.052	0.052	0.055		

d = mean of differences Sd_{lab} = standard deviation of differences t = Student test - comparison to 0

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

ISO 9622|IDF141 : Precision of the method : Sr = 0.014 g / 100 g
SR =0,04 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	-1.04	-0.74	-0.81	-0.35	-0.56	-0.07	-0.18	-0.15	+0.59	-0.63
2	-11.32	-8.77	-7.17	-6.41	-0.42	-2.46	+2.65	+0.34	-0.84	-0.15
3	+0.60	+0.56	+0.38	+0.45	-0.42	+0.53	+0.21	+0.14	+0.21	+0.42
4	-0.57	-0.38	-0.32	-0.35	-0.31	-0.37	-0.43	-0.49	-0.46	-0.56
5	+0.75	+0.64	+0.55	+0.45	+0.59	+0.36	+0.13	+0.05	+0.11	+0.51
6	-1.20	-0.74	-0.90	-0.94	-1.42	-0.84	-1.13	-1.12	-1.23	-0.92
7	-1.27	-1.47	-1.40	-1.44	-2.00	-1.18	-1.21	-1.51	-1.42	-1.40
8	+0.44	+0.40	+0.46	+0.75	+1.30	+0.62	+0.45	+0.53	+0.59	+0.51
9	+1.34	+1.61	+1.48	+1.24	+0.44	+0.96	+0.60	+0.63	+0.40	+1.37
10	+0.83	+0.88	+1.14	+0.94	+1.16	+0.96	+0.84	+1.02	+0.98	+1.18
11	+0.25	-0.01	-0.03	-0.20	-0.10	-0.23	-0.36	-0.55	-0.49	-0.00
12	+1.14	+1.37	+1.48	+1.44	+1.73	+1.39	+1.08	+1.60	+1.46	+1.66
13	+0.36	+0.07	+0.12	+0.05	+0.30	+0.19	-0.18	-0.15	-0.08	+0.13
14	+0.21	+0.15	+0.12	+0.15	-0.13	+0.44	+0.37	+0.53	+0.78	+0.13
15	-4.23	-4.39	-4.54	-5.12	-7.02	-4.35	-4.04	-4.81	-4.68	-5.02
16	-0.18	-0.41	-0.39	-0.75	-0.13	-0.67	-0.97	+0.34	-0.84	+0.04
17	-0.57	-0.66	-0.98	-1.64	-2.43	-1.44	-1.68	-2.19	-2.09	-1.20
18	+2.15	+2.34	+2.41	+2.63	+3.89	+2.24	+2.02	+2.57	+2.51	+2.61
19	-0.42	-0.17	-0.39	-0.35	-0.27	-0.33	-0.58	-0.73	-0.37	-0.44
20	-1.51	-1.22	-1.07	-0.45	+0.59	-0.15	-0.10	+0.05	+0.31	-0.82
21	+0.83	+0.72	+0.63	+0.45	+0.30	+0.27	-0.03	+0.05	-0.08	+0.51
22	-1.51	-1.22	-1.15	-0.55	+0.44	-0.24	-0.18	-0.05	+0.21	-0.82
23	-0.10	-0.90	-0.47	-0.55	-0.13	-0.24	+0.37	-0.44	+0.21	-0.82

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

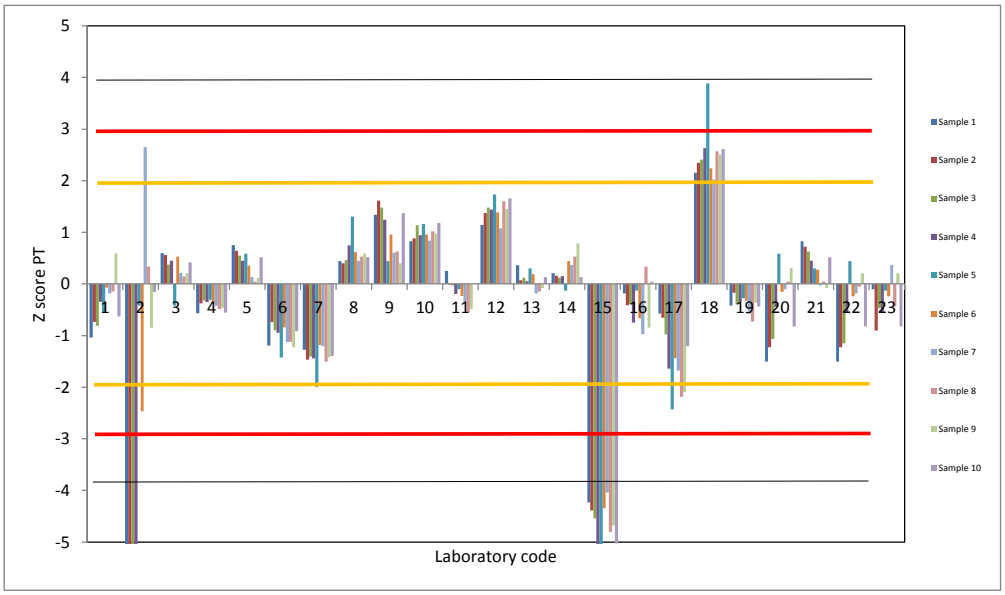


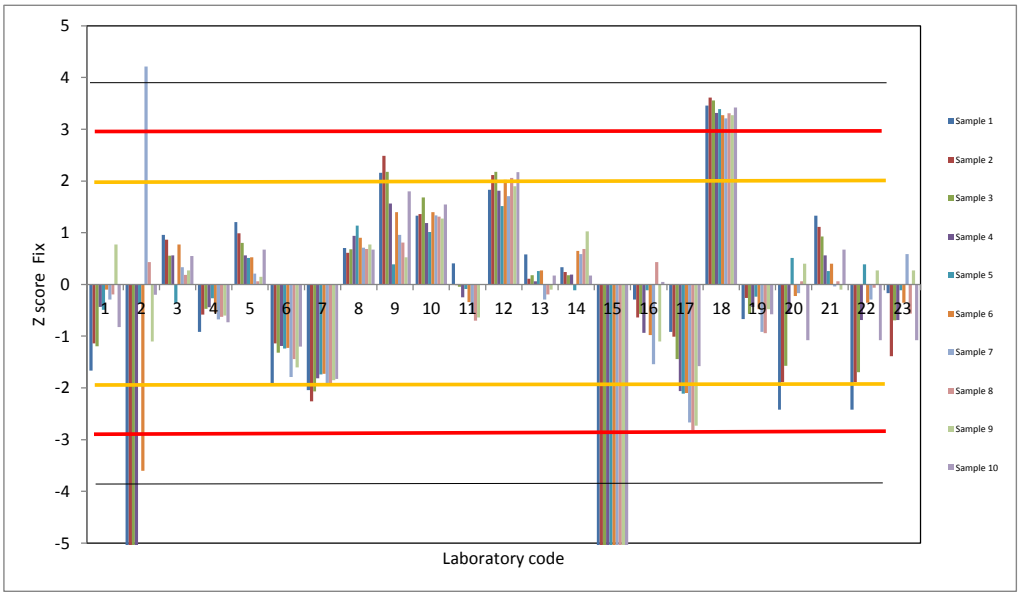
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-1.67	-1.14	-1.20	-0.44	-0.49	-0.10	-0.29	-0.19	+0.77	-0.83
2	-18.17	-13.51	-10.57	-8.06	-0.36	-3.60	+4.21	+0.43	-1.10	-0.20
3	+0.96	+0.86	+0.55	+0.56	-0.36	+0.77	+0.33	+0.18	+0.27	+0.55
4	-0.92	-0.58	-0.47	-0.44	-0.27	-0.55	-0.68	-0.63	-0.60	-0.73
5	+1.21	+0.99	+0.80	+0.56	+0.51	+0.52	+0.21	+0.06	+0.15	+0.67
6	-1.92	-1.14	-1.32	-1.19	-1.24	-1.23	-1.79	-1.44	-1.60	-1.20
7	-2.04	-2.26	-2.07	-1.81	-1.74	-1.73	-1.92	-1.94	-1.85	-1.83
8	+0.71	+0.61	+0.68	+0.94	+1.14	+0.90	+0.71	+0.68	+0.77	+0.67
9	+2.16	+2.49	+2.18	+1.56	+0.39	+1.40	+0.96	+0.81	+0.52	+1.80
10	+1.33	+1.36	+1.68	+1.19	+1.01	+1.40	+1.33	+1.31	+1.27	+1.55
11	+0.41	-0.01	-0.05	-0.25	-0.09	-0.34	-0.57	-0.70	-0.64	-0.00
12	+1.83	+2.11	+2.18	+1.81	+1.51	+2.02	+1.71	+2.06	+1.90	+2.17
13	+0.58	+0.11	+0.18	+0.06	+0.26	+0.27	-0.29	-0.19	-0.10	+0.17
14	+0.33	+0.24	+0.18	+0.19	-0.11	+0.65	+0.58	+0.68	+1.02	+0.17
15	-6.79	-6.76	-6.70	-6.44	-6.11	-6.35	-6.42	-6.19	-6.10	-6.58
16	-0.29	-0.64	-0.57	-0.94	-0.11	-0.98	-1.54	+0.43	-1.10	+0.05
17	-0.92	-1.01	-1.45	-2.06	-2.11	-2.10	-2.67	-2.82	-2.73	-1.58
18	+3.46	+3.61	+3.55	+3.31	+3.39	+3.27	+3.21	+3.31	+3.27	+3.42
19	-0.67	-0.26	-0.57	-0.44	-0.24	-0.48	-0.92	-0.94	-0.48	-0.58
20	-2.42	-1.89	-1.57	-0.56	+0.51	-0.23	-0.17	+0.06	+0.40	-1.08
21	+1.33	+1.11	+0.93	+0.56	+0.26	+0.40	-0.04	+0.06	-0.10	+0.67
22	-2.42	-1.89	-1.70	-0.69	+0.39	-0.35	-0.29	-0.07	+0.27	-1.08
23	-0.17	-1.39	-0.70	-0.69	-0.11	-0.35	+0.58	-0.57	+0.27	-1.08

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=0,040 g/100 g

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



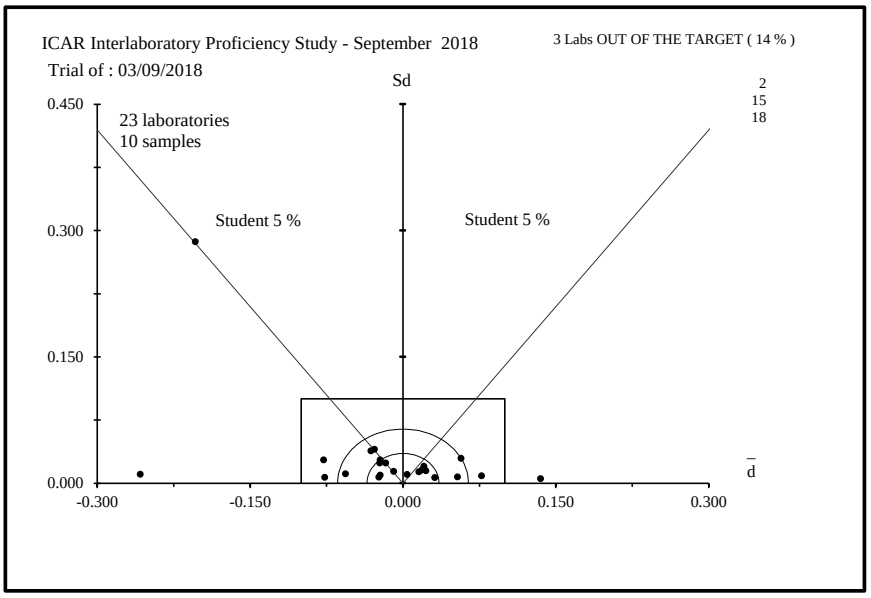


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST

RAW MILK
Lactose Routine method
September 2018

AIA-Laboratorio Standard Latte	Maccarese	Italy
Artificial Insemination and Stock Breeding	Siguldas	Latvia
Associacao Iterprofissional do Leite e Lacticinios	Lousada	Purtugal
Cen. Lab.rozboru mleka	Zilina	Slovakia
Central Milk Lab ICBA	Caesarea	Israel
CIS	Teiford Shropshire	England
Council of Agriculture, Executive Yuan, Taiwan Animal Germplasm Center of TLRI	Taiwan	Taiwan
Dairy Cattle Research Center	Shandong	China
Eastern Lab services	Medina	USA
Eurofins Steins Laboratory A/B Sweden	Jönköping	Sweden
Laborator pro rozbor mléka Brno, Ceskomoravská spolecnost chovatelú a.s.	Brno	Czech Republic
Laboratorium Oceny Mleka (KCHZ), Laboratorium Referencyjne z siedziba w Parzniewie	Pruszkow	Poland
Mérieux NutriSciences	Cape Town	South Africa
Mérieux NutriSciences	Midrand	South Africa
Shanghai Dairy Cattle Breeding Center Co., Ltd	Shanghai	China
Suisselab AG	Zollikofen	Switzerland
Tine Ramelklaboratoriet Bergen	Bergen	Norvey
Tine Ramelklaboratoriet Heimdal	Heimdal	Norvey
University of Ljubljana, Biote Slovenia	Podkrajsek	Lithuania
Valio	Seinajoki	Finland
Vetlab Agricultural Showgrouds	Lusaka	Zambia

ICAR
PROFICIENCY TESTING SCHEME

September 2018

Raw Milk

Determination of UREA CONTENT
Routine method

Sending date of statistical treatment : 18.10.2018

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

ACTALIA CECALAIT

cofrac COMPARAISONS INTERLABORATOIRES

ACCRÉDITATION
N° 1-2473
PORTÉE
DISPONIBLE SUR
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Table 1 : **Ranking of the laboratories** Units : mg / 100 g

Nb	%	N°	ig d	Sd	D
1	5	10	+ 0.92	1.29	1.59
2	9	11	- 1.09	1.21	1.63
3	14	3	- 0.63	1.65	1.76
4	18	22	+ 1.24	1.52	1.96
5	23	13	+ 2.63	0.71	2.72
6	27	6	+ 2.72	1.07	2.92
7	32	16	- 2.63	1.90	3.24
8	36	12	- 2.67	2.42	3.61
9	41	5	+ 3.45	2.80	4.44
10	45	14	+ 4.34	1.53	4.61
11	50	15	- 3.81	3.76	5.35
12	55	9	- 5.27	1.13	5.39
13	59	4	- 4.93	2.28	5.43
14	64	2	+ 5.86	1.77	6.12
15	68	7	- 5.16	3.48	6.22
16	73	1	+ 6.49	1.31	6.62
17	77	20	- 5.79	4.55	7.36
18	82	17	+ 5.52	8.75	10.34
19	86	8	- 14.02	0.70	14.04
20	91	18	- 35.82	11.01	37.48
21	95	19	- 36.97	11.18	38.62
22	100	21	- 37.07	11.21	38.73

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 / 100 g for $\bar{d}$ and 1,50 mg / 100 g for Sd

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 18 sets of results send by 22 laboratories using routine method ISO 9622|IDF 141, 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}	0.87
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	4.72

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0.50	0.25	0.25	1.00	0.25	0.50	0.50	0.25	0.75	1.25	0.45	20
2	0.40	0.30	1.00	0.60	0.80	0.50	0.30	0.20	0.30	0.50	0.39	20
3	2.91	0.97	0.97	1.94	3.88 *	0.00	0.00	1.94	0.97	1.94	1.37	20
4	1.60	0.70	1.10	3.50	0.60	3.10	2.90 *	0.00	0.30	1.00	1.34	20
5	1.03	1.03	3.09	1.03	1.03	2.06	0.00	0.00	2.06	2.06	1.15	20
6	0.9	1.7	0.5	0	0.4	0.7	0.3	0.8	4.4 *	0.3	1.113	20
7	2.20	0.90	5.70 *	0.00	0.00	1.00	1.70	1.60	0.50	0.00	1.50	20
8	2.20	0.10	2.10	0.80	2.00	0.20	0.10	1.20	0.20	0.00	0.88	20
9	0.10	0.40	0.60	0.30	0.50	0.60	0.30	0.90	0.30	0.30	0.34	20
10	1.07	0.08	0.02	0.02	0.13	0.33	0.32	0.04	0.04	0.04	0.26	20
11	0.21	0.42	0.83	0.42	0.21	0.21	0.00	0.21	0.62	0.00	0.28	20
12	1.60	1.60	0.30	0.30	0.10	0.40	0.00	4.00 *	1.10	0.70	1.08	20
13	0.80	3.80 *	2.60	1.90	1.70	3.20	1.20	4.40 *	1.20	2.70	1.85	20
14	1.40	0.80	0.50	2.40	2.30	0.80	1.20	1.60	1.10	2.90	1.19	20
15	0.20	0.20	0.90	0.20	0.30	0.30	0.80	0.60	0.70	0.80	0.40	20
16	0.60	1.20	0.60	3.00	2.40	1.20	0.00	1.80	1.20	1.80	1.15	20
17	0.64	0.86	1.28	1.07	0.43	1.07	0.43	0.43	1.07	0.86	0.61	20
18	0.34	0.06	0.20	0.03	0.15	0.00	0.26	0.41	0.22	0.30	0.17	20
19	0.13	0.31	0.06	0.05	0.04	0.12	0.06	0.08	0.07	0.09	0.09	20
20	1.30	0.20	0.60	0.60	0.60	0.20	0.20	0.10	0.10	0.70	0.41	20
21	0.00	0.05	0.04	0.20	0.24	0.16	0.14	0.10	0.15	0.02	0.10	20
22	1.03	0.00	1.03	2.06	1.03	1.03	2.06	0.00	1.03	1.03	0.86	20
Sr	0.87	0.78	1.19	1.00	0.92	0.84	0.67	1.08	0.88	0.87		440
NE	44	44	44	44	44	44	44	44	44	44		
L	3.47	2.15	3.36	3.99	2.90	3.38	2.09	2.49	2.36	3.49		

Sr : repeatability standard deviation of each laboratory limit 0,54 mg/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=1,50 according ISO 14637|IDF 195

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	28.75	45.38	57.13	43.25	37.88	51.75	33.50	61.88	66.63	70.38
2	26.30	46.85	53.50	42.10	37.60	52.75	32.75	62.20	64.85	71.25
3	22.82	41.26	48.06	35.92	29.13	45.63	26.21	53.40	60.68	62.14
4	17.50	35.65	45.25	30.85	25.50	39.75	19.15	52.70	54.45	61.50
5	22.15	43.78	54.08	38.63	33.48	50.47	28.84	60.77	63.86	70.04
6	26.55	41.65	52.05	38.60	35.50	48.05	30.35	57.10	63.10	65.85
7	23.90	36.45	39.75	32.90	30.20	39.80	26.25	47.20	50.75	52.80
8	10.00	27.05	35.55	23.20	18.50	31.40	13.25	39.70	44.50	48.20
9	18.45	36.60	45.70	30.65	26.45	40.30	21.15	48.45	53.85	57.25
10	22.68	41.40	52.08	38.52	32.73	45.06	28.17	55.31	60.54	64.26
11	22.59	39.14	47.05	34.56	30.50	45.07	26.02	52.98	59.44	63.29
12	19.00	37.80	46.25	31.75	27.35	43.20	23.80	52.20	57.25	66.25
13	27.50	43.30	51.90	38.55	34.75	48.50	31.90	56.80	59.20	65.45
14	25.80	43.80	56.45	40.10	35.85	49.40	31.70	59.00	63.15	69.75
15	25.40	37.80	44.25	34.30	32.05	40.65	28.40	46.70	49.95	54.00
16	24.30	38.40	45.90	34.50	30.00	42.60	27.60	49.50	55.20	57.30
17	27.94	64.88	55.67	41.43	36.40	50.86	32.12	61.88	45.50	70.02
18	4.04	7.13	8.36	6.42	5.69	7.30	4.85	9.02	9.77	10.78
19	3.20	5.96	7.17	5.10	4.72	6.50	3.81	7.81	8.54	9.12
20	23.85	35.80	42.00	33.60	30.20	38.70	27.70	44.25	47.85	49.75
21	3.24	5.79	7.12	5.20	4.34	6.44	3.75	7.53	8.37	9.07
22	22.15	42.23	50.99	37.08	33.48	46.87	27.81	55.62	61.29	66.44
M	20.37	36.28	43.01	31.69	27.83	39.59	24.05	47.36	50.40	55.22
REF.	23.82	40.39	49.40	36.51	32.19	45.52	28.23	54.37	57.76	63.37
SD	8.00	13.96	15.42	11.53	10.33	14.29	9.37	17.03	17.99	19.71

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 18 laboratories using the Routine method ISO 9622 | IDF 141, after discard outliers with Grubbs test at 5 %.

Table IV : Outliers identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran		13	7		3		4	12; 13	6	
Outliers Grubbs										
Sr	0.88	0.60	0.86	1.09	0.73	0.93	0.58	1.17	0.66	0.96
SR	3.28	3.57	4.70	3.95	3.83	4.61	3.34	5.67	6.23	6.60

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd_{lab}	t
1	+ 4.93	+ 4.98	+ 7.73	+ 6.74	+ 5.69	+ 6.23	+ 5.27	+ 7.51	+ 8.87	+ 7.00	+ 6.49	1.31	15.68
2	+ 2.48	+ 6.46	+ 4.10	+ 5.59	+ 5.41	+ 7.23	+ 4.52	+ 7.83	+ 7.09	+ 7.88	+ 5.86	1.77	10.45
3	- 1.00	+ 0.87	- 1.34	- 0.58	- 3.06	+ 0.11	- 2.02	- 0.97	+ 2.92	- 1.24	- 0.63	1.65	1.21
4	- 6.32	- 4.74	- 4.15	- 5.66	- 6.69	- 5.77	- 9.08	- 1.67	- 3.31	- 1.87	- 4.93	2.28	6.84
5	- 1.67	+ 3.38	+ 4.68	+ 2.12	+ 1.29	+ 4.95	+ 0.61	+ 6.40	+ 6.10	+ 6.67	+ 3.45	2.80	3.90
6	+ 2.73	+ 1.26	+ 2.65	+ 2.09	+ 3.31	+ 2.53	+ 2.12	+ 2.73	+ 5.34	+ 2.48	+ 2.72	1.07	8.09
7	+ 0.08	- 3.94	- 9.65	- 3.61	- 1.99	- 5.72	- 1.98	- 7.17	- 7.01	- 10.57	- 5.16	3.48	4.69
8	- 13.82	- 13.34	- 13.85	- 13.31	- 13.69	- 14.12	- 14.98	- 14.67	- 13.26	- 15.17	- 14.02	0.70	63.34
9	- 5.37	- 3.79	- 3.70	- 5.86	- 5.74	- 5.22	- 7.08	- 5.92	- 3.91	- 6.12	- 5.27	1.13	14.75
10	- 1.14	+ 1.01	+ 2.68	+ 2.01	+ 0.54	- 0.47	- 0.06	+ 0.94	+ 2.78	+ 0.89	+ 0.92	1.29	2.24
11	- 1.23	- 1.26	- 2.35	- 1.95	- 1.69	- 0.45	- 2.21	- 1.39	+ 1.68	- 0.09	- 1.09	1.21	2.86
12	- 4.82	- 2.59	- 3.15	- 4.76	- 4.84	- 2.32	- 4.43	- 2.17	- 0.51	+ 2.88	- 2.67	2.42	3.49
13	+ 3.68	+ 2.91	+ 2.50	+ 2.04	+ 2.56	+ 2.98	+ 3.67	+ 2.43	+ 1.44	+ 2.08	+ 2.63	0.71	11.75
14	+ 1.98	+ 3.41	+ 7.05	+ 3.59	+ 3.66	+ 3.88	+ 3.47	+ 4.63	+ 5.39	+ 6.38	+ 4.34	1.53	8.97
15	+ 1.58	- 2.59	- 5.15	- 2.21	- 0.14	- 4.87	+ 0.17	- 7.67	- 7.81	- 9.37	- 3.81	3.76	3.20
16	+ 0.48	- 1.99	- 3.50	- 2.01	- 2.19	- 2.92	- 0.63	- 4.87	- 2.56	- 6.07	- 2.63	1.90	4.38
17	+ 4.12	+ 24.49	+ 6.27	+ 4.93	+ 4.21	+ 5.33	+ 3.89	+ 7.51	- 12.26	+ 6.65	+ 5.52	8.75	1.99
18	- 19.78	- 33.26	- 41.04	- 30.09	- 26.50	- 38.22	- 23.38	- 45.35	- 47.99	- 52.59	- 35.82	11.01	10.29
19	- 20.62	- 34.44	- 42.23	- 31.41	- 27.47	- 39.02	- 24.42	- 46.56	- 49.22	- 54.26	- 36.97	11.18	10.45
20	+ 0.03	- 4.59	- 7.40	- 2.91	- 1.99	- 6.82	- 0.53	- 10.12	- 9.91	- 13.62	- 5.79	4.55	4.02
21	- 20.58	- 34.61	- 42.28	- 31.31	- 27.85	- 39.08	- 24.48	- 46.84	- 49.39	- 54.30	- 37.07	11.21	10.46
22	- 1.67	+ 1.84	+ 1.59	+ 0.57	+ 1.29	+ 1.34	- 0.42	+ 1.25	+ 3.53	+ 3.06	+ 1.24	1.52	2.58
d	- 3.45	- 4.12	- 6.39	- 4.81	- 4.36	- 5.93	- 4.18	- 7.01	- 7.36	- 8.15	- 5.58	14.04	
Sd	8.00	13.96	15.42	11.53	10.33	14.29	9.37	17.03	17.99	19.71	14.25		

d = mean of differences Sd_{lab} = standard deviation of differences t = Student test - comparison to 0

Upper limits : $\bar{d}$ = +/- 2,50 mg / 100 g Sd = 1,50 mg / 100 g

ISO 14637|IDF 195 : Precision of the method : Sr = 0.54 mg / 100 g
SR = 1.81 mg / 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	+0.62	+0.36	+0.50	+0.58	+0.55	+0.44	+0.56	+0.44	+0.49	+0.36
2	+0.31	+0.46	+0.27	+0.49	+0.52	+0.51	+0.48	+0.46	+0.39	+0.40
3	-0.13	+0.06	-0.09	-0.05	-0.30	+0.01	-0.22	-0.06	+0.16	-0.06
4	-0.79	-0.34	-0.27	-0.49	-0.65	-0.40	-0.97	-0.10	-0.18	-0.10
5	-0.21	+0.24	+0.30	+0.18	+0.12	+0.35	+0.07	+0.38	+0.34	+0.34
6	+0.34	+0.09	+0.17	+0.18	+0.32	+0.18	+0.23	+0.16	+0.30	+0.13
7	+0.01	-0.28	-0.63	-0.31	-0.19	-0.40	-0.21	-0.42	-0.39	-0.54
8	-1.73	-0.96	-0.90	-1.15	-1.32	-0.99	-1.60	-0.86	-0.74	-0.77
9	-0.67	-0.27	-0.24	-0.51	-0.56	-0.37	-0.76	-0.35	-0.22	-0.31
10	-0.14	+0.07	+0.17	+0.17	+0.05	-0.03	-0.01	+0.06	+0.15	+0.04
11	-0.15	-0.09	-0.15	-0.17	-0.16	-0.03	-0.24	-0.08	+0.09	-0.00
12	-0.60	-0.19	-0.20	-0.41	-0.47	-0.16	-0.47	-0.13	-0.03	+0.15
13	+0.46	+0.21	+0.16	+0.18	+0.25	+0.21	+0.39	+0.14	+0.08	+0.11
14	+0.25	+0.24	+0.46	+0.31	+0.35	+0.27	+0.37	+0.27	+0.30	+0.32
15	+0.20	-0.19	-0.33	-0.19	-0.01	-0.34	+0.02	-0.45	-0.43	-0.48
16	+0.06	-0.14	-0.23	-0.17	-0.21	-0.20	-0.07	-0.29	-0.14	-0.31
17	+0.52	+1.75	+0.41	+0.43	+0.41	+0.37	+0.42	+0.44	-0.68	+0.34
18	-2.47	-2.38	-2.66	-2.61	-2.57	-2.67	-2.50	-2.66	-2.67	-2.67
19	-2.58	-2.47	-2.74	-2.72	-2.66	-2.73	-2.61	-2.73	-2.74	-2.75
20	+0.00	-0.33	-0.48	-0.25	-0.19	-0.48	-0.06	-0.59	-0.55	-0.69
21	-2.57	-2.48	-2.74	-2.71	-2.70	-2.73	-2.61	-2.75	-2.75	-2.75
22	-0.21	+0.13	+0.10	+0.05	+0.12	+0.09	-0.04	+0.07	+0.20	+0.16

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

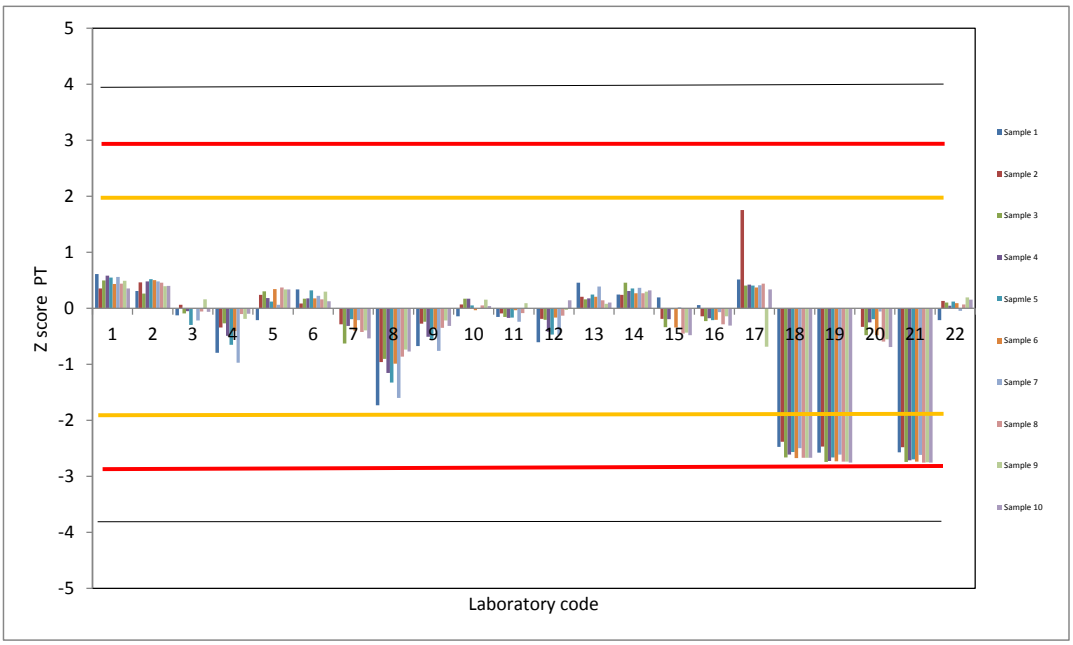


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

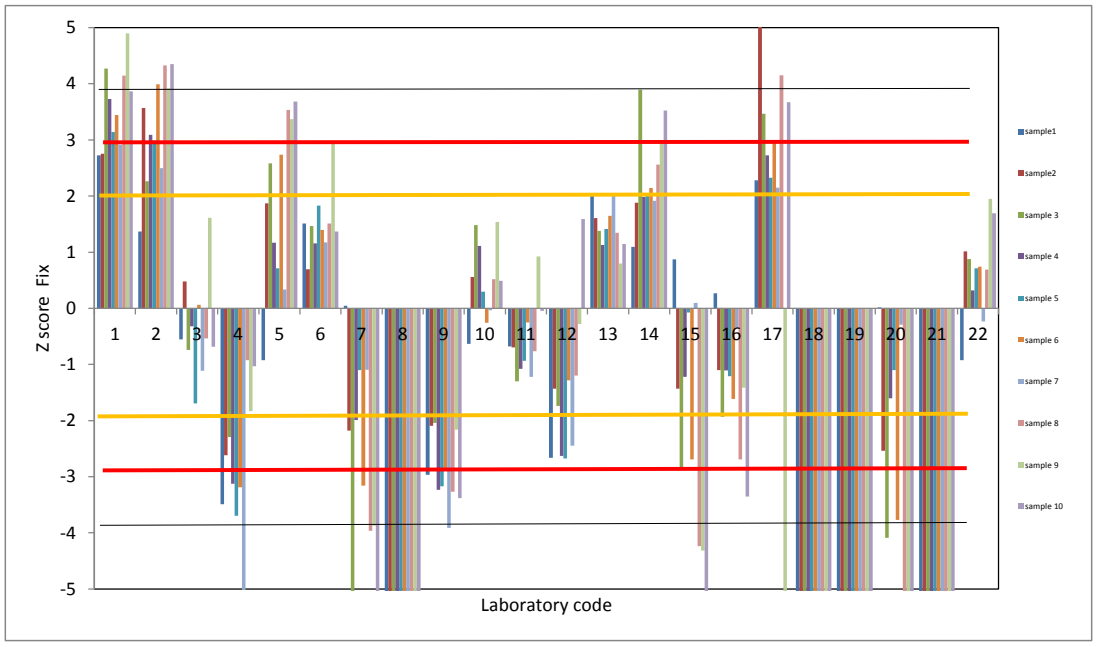
Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+2.72	+2.75	+4.27	+3.73	+3.14	+3.44	+2.91	+4.15	+4.90	+3.87
2	+1.37	+3.57	+2.27	+3.09	+2.99	+3.99	+2.50	+4.33	+3.92	+4.35
3	-0.55	+0.48	-0.74	-0.32	-1.69	+0.06	-1.11	-0.54	+1.61	-0.68
4	-3.49	-2.62	-2.29	-3.12	-3.70	-3.19	-5.02	-0.92	-1.83	-1.04
5	-0.93	+1.87	+2.58	+1.17	+0.71	+2.73	+0.34	+3.54	+3.37	+3.68
6	+1.51	+0.69	+1.46	+1.16	+1.83	+1.40	+1.17	+1.51	+2.95	+1.37
7	+0.04	-2.18	-5.33	-1.99	-1.10	-3.16	-1.09	-3.96	-3.87	-5.84
8	-7.64	-7.37	-7.65	-7.35	-7.56	-7.80	-8.28	-8.10	-7.33	-8.38
9	-2.97	-2.10	-2.04	-3.24	-3.17	-2.89	-3.91	-3.27	-2.16	-3.38
10	-0.63	+0.56	+1.48	+1.11	+0.30	-0.26	-0.03	+0.52	+1.54	+0.49
11	-0.68	-0.69	-1.30	-1.08	-0.93	-0.25	-1.22	-0.77	+0.93	-0.05
12	-2.66	-1.43	-1.74	-2.63	-2.67	-1.28	-2.45	-1.20	-0.28	+1.59
13	+2.03	+1.61	+1.38	+1.13	+1.42	+1.65	+2.03	+1.34	+0.80	+1.15
14	+1.09	+1.88	+3.90	+1.99	+2.02	+2.14	+1.92	+2.56	+2.98	+3.52
15	+0.87	-1.43	-2.85	-1.22	-0.08	-2.69	+0.09	-4.24	-4.31	-5.18
16	+0.27	-1.10	-1.93	-1.11	-1.21	-1.61	-0.35	-2.69	-1.41	-3.36
17	+2.28	+13.53	+3.47	+2.72	+2.33	+2.95	+2.15	+4.15	-6.77	+3.67
18	-10.93	-18.38	-22.67	-16.62	-14.64	-21.12	-12.92	-25.06	-26.51	-29.06
19	-11.39	-19.03	-23.33	-17.35	-15.18	-21.56	-13.49	-25.72	-27.20	-29.98
20	+0.02	-2.54	-4.09	-1.61	-1.10	-3.77	-0.29	-5.59	-5.47	-7.53
21	-11.37	-19.12	-23.36	-17.30	-15.39	-21.59	-13.52	-25.88	-27.29	-30.00
22	-0.93	+1.01	+0.88	+0.32	+0.71	+0.74	-0.23	+0.69	+1.95	+1.69

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 g/100 g

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

Figure 3 :

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



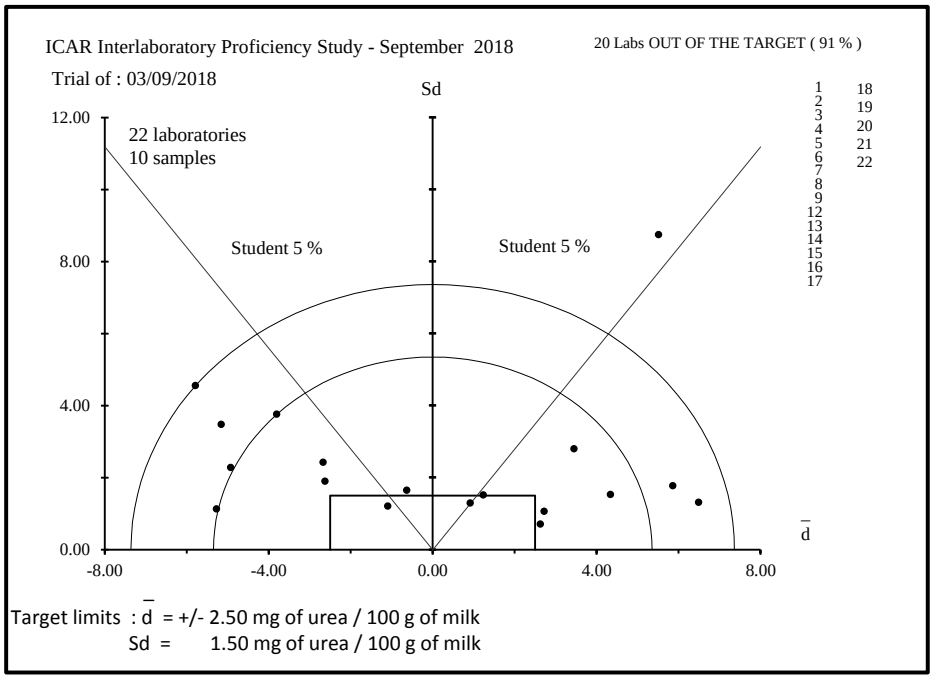


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

ICAR PROFICIENCY TEST
RAW MILK

Urea Routine method
September 2018

Alip	**Sousada**	Portugal
Cattle Information Service (CIS)	Teiford	England
Central Milk Lab ICBA	Caesarea	Israel
Dairy Cattle Research Center of Shandong Academy of Agricultural Sciences	Shandong	China
Eastern Lab services	Medina	USA
Eurofins Steins Laboratory A/B	Jönköping	Sweden
Laborator pro rozbor mléka Brno, Ceskomoravská spolecnost chovatelú a.s.	Brno	Czech Republic
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Pruszkow	Poland
Merieux Nutriscience South Africa	Cape Town	South Africa
Merieux Nutriscience South Africa (Midrand)	Midrand	South Africa
Osuuskunta Satamaito, laboratorio	Pori	Finland
Plemenárske sluzby SR s.p.	Zilina	Slovakia
Shangai dairy breeding center Co.Ltd	Shanghai	China
Suisselab AG	Zullikofen	Switzerland
Taiwan Livestock research Insitute	Taiwan	Taiwan
Tine Ramelklaboratoriet Bergen	Bergen	Norvey
Tine Ramelklaboratoriet Heimdal	Heimdal	Norvey
Univ. of Ljubljana dept. of Animal Sc. Inst. of Dairy Sc. and Probiotics	Domzale	Slovenia
Valio Oy/Seinajoen aluelaboratorio	Seinajoki	Finland

ICAR
PROFICIENCY TESTING SCHEME

September 2018

Raw Milk

BHB Beta-HydroxyButyrate

Sending date of statistical treatment : 18.09.2018

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

Table I : **Ranking of the laboratories** Units : milimole of BHB / liter of milk

Nb	%	N°	ig d	Sd	D	Method
1	8	6	+ 0.010	0.009	0.014	A
2	15	11	- 0.013	0.011	0.017	A
3	23	13	+ 0.015	0.009	0.017	A
4	31	3	- 0.016	0.011	0.019	B
5	38	1	- 0.012	0.020	0.024	A
6	46	9	+ 0.023	0.014	0.027	A
7	54	5	- 0.025	0.022	0.034	A
8	62	8	- 0.029	0.018	0.034	A
9	69	12	- 0.043	0.020	0.048	A
10	77	2	+ 0.072	0.027	0.077	B
11	85	10	+ 0.021	0.106	0.108	C
12	92	7	+ 0.148	0.060	0.160	A
13	100	4	- 0.156	0.059	0.167	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 :

$\bar{d}$ = +/- 0,045 milimole of BHB / liter of milk
Sd = 0,045 milimole of BHB / liter of milk

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 13 set of results send by 13 laboratories discarging using Grubbs test at 5 % risk level

A I.R.
B Chemical method
C No specify 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))

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %)	Sr_{PT}	0.014
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0.065

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.

Table II : **REPEATABILITY - Absolute difference between replicates in milimole of BHB / liter of milk**

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0.020	0.020	0.040	0.030	0.020	0.050	0.060	0.020	0.030	0.000	0.024	20
2	0.010	0.003	0.005	0.004	0.003	0.005	0.000	0.000	0.004	0.000	0.003	20
3	0.010	0.000	0.000	0.010	0.000	0.000	0.000	0.010	0.000	0.010	0.004	20
4	0.004	0.000	0.000	0.010	0.000	0.000	0.010	0.000	0.000	0.000	0.003	20
5	0.000	0.004	0.002	0.002	0.007	0.006	0.018	0.007	0.003	0.003	0.005	20
6	0.000	0.000	0.010	0.020	0.020	0.000	0.010	0.010	0.020	0.000	0.009	20
7	**	**	**	**	**	**	**	**	**	**		
8	0.030	0.000	0.020	0.020	0.040	0.030	0.040	0.010	0.010	0.010	0.017	20
9	0.040	0.020	0.010	0.020	0.060	0.020	0.010	0.000	0.010	0.020	0.019	20
10	0.029	0.002	0.030	0.003	0.013	0.064	0.055	0.017	0.036	0.081 *	0.029	20
11	0.020	0.020	0.010	0.020	0.010	0.010	0.020	0.040	0.010	0.020	0.014	20
12	0.007	0.002	0.005	0.014	0.014	0.011	0.004	0.023	0.020	0.014	0.009	20
13	0.010	0.000	0.010	0.020	0.030	0.020	0.000	0.000	0.010	0.010	0.010	20
Sr	0.014	0.007	0.012	0.012	0.018	0.019	0.020	0.011	0.012	0.018		240
NE	24	24	24	24	24	24	24	24	24	24		
L	0.049	0.026	0.042	0.042	0.063	0.068	0.071	0.041	0.043	0.027		

Sr : repeatability standard deviation of each laboratory limit 0,011 milimole of BHB / liter of milk

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=0,030 milimole of BHB / liter of milk

Table III : **Means of the replicates in milimole of BHB / liter of milk**

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	0.240	0.170	0.150	0.125	0.210	0.235	0.260	0.110	0.195	0.260
2	0.355	0.198	0.226	0.139	0.296	0.331	0.397	0.172	0.265	0.420
3	0.245	0.140	0.160	0.105	0.200	0.220	0.260	0.125	0.180	0.285
4	0.058	0.040	0.050	0.035	0.050	0.060	0.065	0.040	0.050	0.070
5	0.235	0.139	0.152	0.118	0.179	0.217	0.232	0.127	0.165	0.261
6	0.270	0.170	0.185	0.130	0.230	0.250	0.285	0.135	0.210	0.310
7	0.470	0.260	0.310	0.170	0.320	0.450	0.510	0.220	0.320	0.530
8	0.215	0.130	0.150	0.090	0.200	0.205	0.240	0.105	0.195	0.255
9	0.270	0.180	0.205	0.150	0.250	0.270	0.295	0.160	0.215	0.310
10	0.313	0.046	0.101	0.033	0.385	0.328	0.432	0.034	0.158	0.453
11	0.260	0.130	0.165	0.110	0.205	0.225	0.270	0.120	0.185	0.280
12	0.197	0.121	0.143	0.087	0.173	0.216	0.222	0.092	0.160	0.234
13	0.275	0.180	0.185	0.120	0.235	0.260	0.300	0.150	0.205	0.315
M	0.262	0.146	0.168	0.109	0.226	0.251	0.290	0.122	0.192	0.306
REF.	0.261	0.148	0.166	0.112	0.227	0.251	0.290	0.122	0.193	0.307
SD	0.093	0.059	0.062	0.040	0.080	0.089	0.109	0.050	0.062	0.113

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 13 laboratories , after outliers discarging using Grubbs test at 5 % risk level.

Table IV : Outliers identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran										10
Outliers Grubbs										
Sr	0.014	0.007	0.012	0.012	0.018	0.019	0.020	0.011	0.012	0.008
SR	0.073	0.050	0.047	0.038	0.080	0.070	0.092	0.044	0.052	0.084

Table V : **ACCURACY - differences (laboratory - reference) in milimole of BHB / liter of milk**

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd_{lab}	t
1	- 0.021	+ 0.022	- 0.016	+ 0.013	- 0.017	- 0.016	- 0.030	- 0.012	+ 0.002	- 0.047	- 0.012	0.020	1.89
2	+ 0.094	+ 0.050	+ 0.060	+ 0.027	+ 0.069	+ 0.080	+ 0.107	+ 0.050	+ 0.072	+ 0.113	+ 0.072	0.027	8.44
3	- 0.016	- 0.008	- 0.006	- 0.007	- 0.027	- 0.031	- 0.030	+ 0.003	- 0.013	- 0.022	- 0.016	0.011	4.29
4	- 0.203	- 0.108	- 0.116	- 0.077	- 0.177	- 0.191	- 0.225	- 0.082	- 0.143	- 0.237	- 0.156	0.059	8.38
5	- 0.026	- 0.009	- 0.014	+ 0.006	- 0.048	- 0.034	- 0.058	+ 0.004	- 0.028	- 0.047	- 0.025	0.022	3.61
6	+ 0.009	+ 0.022	+ 0.019	+ 0.018	+ 0.003	- 0.001	- 0.005	+ 0.013	+ 0.017	+ 0.003	+ 0.010	0.009	3.32
7	+ 0.209	+ 0.112	+ 0.144	+ 0.058	+ 0.093	+ 0.199	+ 0.220	+ 0.098	+ 0.127	+ 0.223	+ 0.148	0.060	7.82
8	- 0.046	- 0.018	- 0.016	- 0.022	- 0.027	- 0.046	- 0.050	- 0.017	+ 0.002	- 0.052	- 0.029	0.018	5.02
9	+ 0.009	+ 0.032	+ 0.039	+ 0.038	+ 0.023	+ 0.019	+ 0.005	+ 0.038	+ 0.022	+ 0.003	+ 0.023	0.014	5.18
10	+ 0.052	- 0.102	- 0.065	- 0.079	+ 0.158	+ 0.077	+ 0.142	- 0.089	- 0.035	+ 0.146	+ 0.021	0.106	0.61
11	- 0.001	- 0.018	- 0.001	- 0.002	- 0.022	- 0.026	- 0.020	- 0.002	- 0.008	- 0.027	- 0.013	0.011	3.64
12	- 0.065	- 0.027	- 0.023	- 0.025	- 0.054	- 0.035	- 0.068	- 0.031	- 0.033	- 0.073	- 0.043	0.020	7.00
13	+ 0.014	+ 0.032	+ 0.019	+ 0.008	+ 0.008	+ 0.009	+ 0.010	+ 0.028	+ 0.012	+ 0.008	+ 0.015	0.009	5.41
d	+ 0.000	- 0.002	+ 0.002	- 0.003	- 0.001	+ 0.001	- 0.000	- 0.000	- 0.000	- 0.001	- 0.000	0.077	
Sd	0.093	0.059	0.062	0.040	0.080	0.089	0.109	0.050	0.062	0.113	0.079		

d = mean of differences Sd_{lab} = standard deviation of differences t = Student test - comparison to 0

Upper limits : $\bar{d}$ = +/- 0,045 milimole of BHB / liter of milk

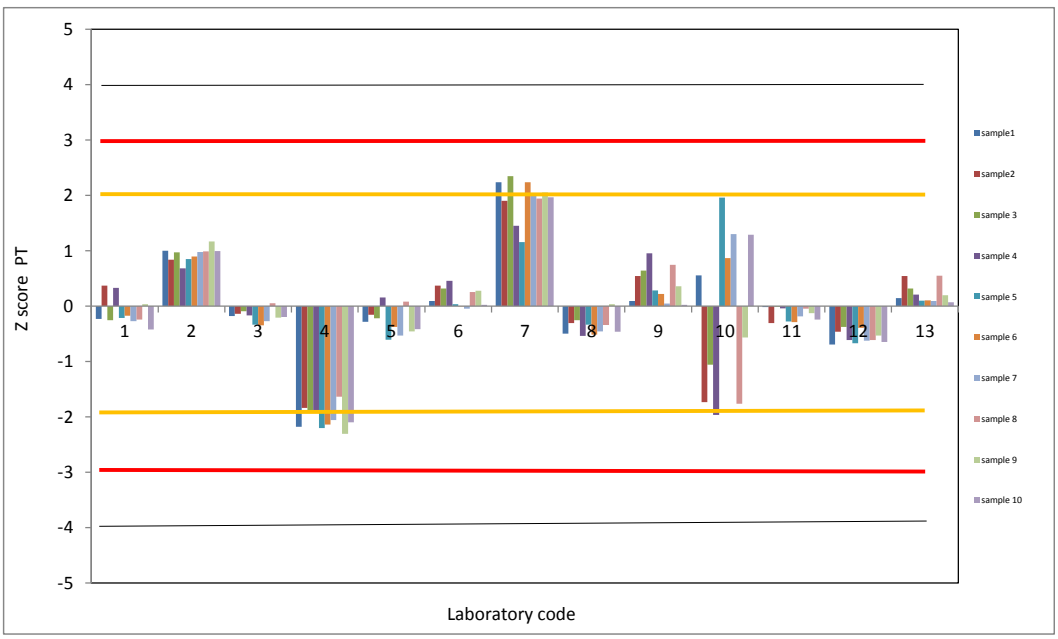
Sd = 0,045 milimole of BHB / liter of milk

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	-0.23	+0.37	-0.25	+0.33	-0.21	-0.17	-0.27	-0.24	+0.04	-0.42
2	+1.00	+0.84	+0.97	+0.68	+0.85	+0.90	+0.98	+0.99	+1.17	+1.00
3	-0.18	-0.14	-0.09	-0.16	-0.34	-0.34	-0.27	+0.06	-0.21	-0.20
4	-2.18	-1.83	-1.88	-1.91	-2.20	-2.14	-2.06	-1.63	-2.30	-2.10
5	-0.28	-0.15	-0.22	+0.16	-0.60	-0.38	-0.53	+0.09	-0.46	-0.41
6	+0.09	+0.37	+0.32	+0.46	+0.04	-0.01	-0.04	+0.25	+0.28	+0.02
7	+2.24	+1.90	+2.35	+1.45	+1.16	+2.24	+2.01	+1.94	+2.05	+1.97
8	-0.50	-0.31	-0.25	-0.54	-0.34	-0.51	-0.46	-0.34	+0.04	-0.46
9	+0.09	+0.54	+0.64	+0.96	+0.29	+0.22	+0.05	+0.75	+0.36	+0.02
10	+0.56	-1.74	-1.05	-1.96	+1.96	+0.87	+1.30	-1.76	-0.56	+1.29
11	-0.01	-0.31	-0.01	-0.04	-0.27	-0.29	-0.18	-0.04	-0.12	-0.24
12	-0.70	-0.46	-0.37	-0.61	-0.67	-0.39	-0.62	-0.61	-0.53	-0.65
13	+0.15	+0.54	+0.32	+0.21	+0.10	+0.11	+0.09	+0.55	+0.20	+0.07

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



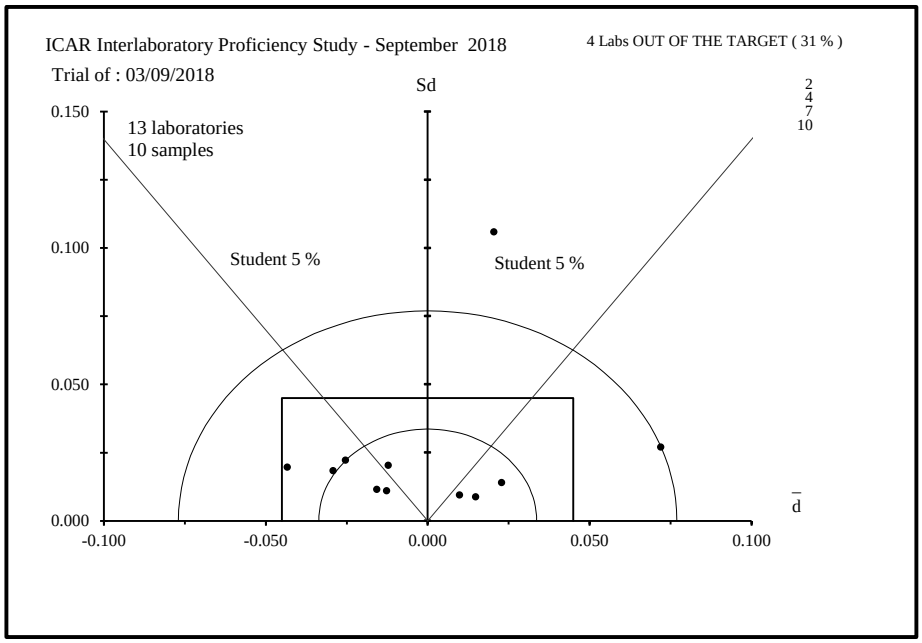


Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
BHB
September 2018

Name	City	Country
Actalia	Poligny	France
Alip	Sousada	Portugal
Cattle Information Service (CIS)	Teiford	England
Center for Green dairy Technology	HanKyong	Korea
Eurofins Steins Laboratory A/B	Jönköping	Sweden
Horizon Lab Ltd	Winnipeg	Canada
KGZS	Ptuj	Slovenia
Laborator pro rozbor mléka Brno, Ceskomoravská spolecnost chovatelú a.s.	Brno	Czech Republic
LRV-LABORATORIO REGIONAL DE VETERINARIA	Azores	Portugal
Shangai dairy breeding center Co.Ltd	Shanghai	China
Taiwan Livestock research Insitute	Taiwan	Taiwan
Valacta - Centre d'Expertise en Production Laitière du Québec	Quebec	Canada

----------End of report----------

ICAR

PROFICIENCY TESTING SCHEME

SEPTEMBER 2018

Cow Raw Milk

DETECTION of PAG (Pregnancy Associated Glycoproteins)

Sending date of statistical treatment : 18.10.2018

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)		
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Table I: **Methods**

N°	METHOD USED
Lab 1	IDEXX
Lab 2	IDEXX
Lab 3	IDEXX
Lab 4	IDEXX
Lab 5	IDEXX

Table II : **Laboratory results**

N°	1	2	3	4	5
Lab 1	Y	N	N	Y	Y
Lab 2	Y	N	N	Y	Y
Lab 3	Y	N	Y	Y	Y
Lab 4	Y	N	`-	Y	Y
Lab 5	Y	N	N	Y	Y
REF	**Y**	**N**	**N**	**Y**	**Y**

Answers : Y = YES; N = NO; to the questions: Presence of PAG (Pregnancy Associated Glycoproteins)

Table III :

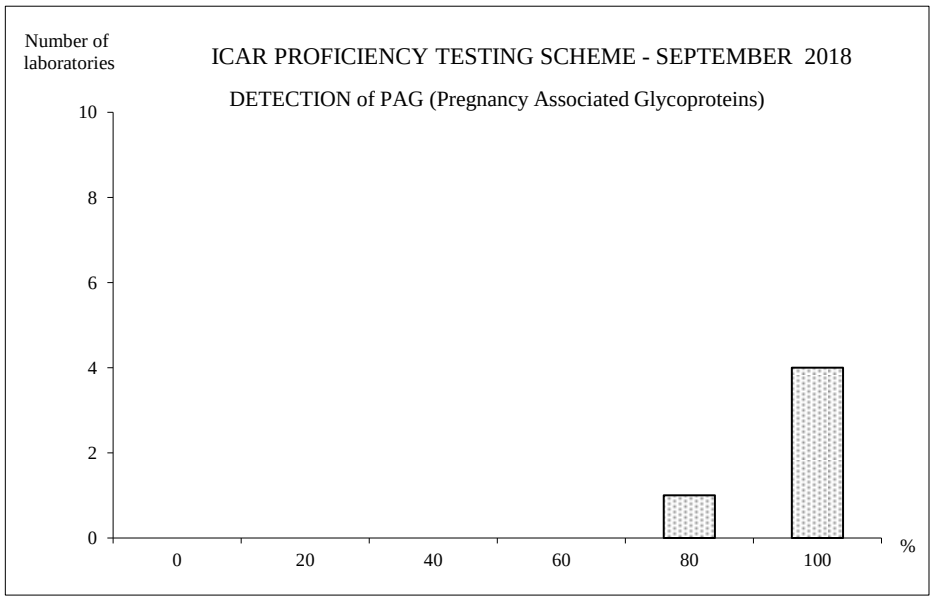
SAMPLES	Milk sample	Insemination date
1	Pregnant - Artificial insemination	28.02.2018
2	Non pregnant	
3	Non pregnant	
4	Pregnant - Artificial insemination	18.06.2018
5	Pregnant - Artificial insemination	18.05.2018

Table IV : Laboratory accuracy with respect to correct results

N°	1	2	3	4	5	FLR%
1	T	T	T	T	T	100
2	T	T	T	T	T	100
3	T	T	F	T	T	80
4	T	T		T	T	100
5	T	T	T	T	T	100
NSR	5	5	3	5	5	
NS	5	5	4	5	5	
FSR%	100	100	75	100	100	

T : True F : False

NSR : number of right answers per sample and criterion
NS : total number of answers per sample and criterion
FSR% : frequency in right answers per sample and criterion
FLR% : relative frequency in right answers per laboratory



LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
PAG
September 2018

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Taiwan Livestock research Insitute	Taiwan	Taiwan

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