THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

ICAR PROFICIENCY TEST - SEPTEMBER 2018

Raw cow milk

"Reference" 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)

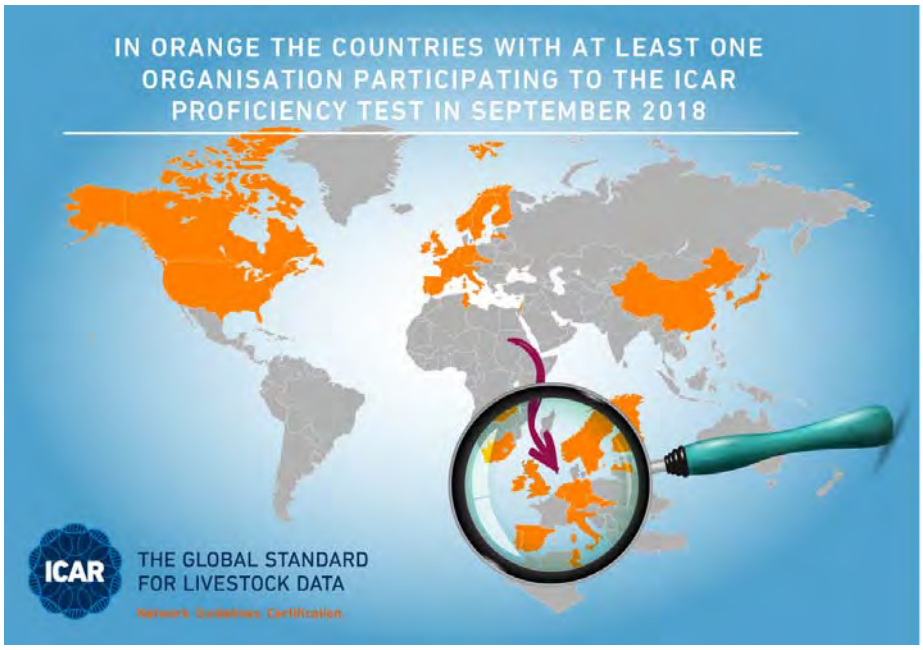


Table 1. Participating milk laboratories to the ICAR Proficiency Test (September 2018)

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 NutriScciences 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

Chemical Reference Methods
Laboratory participation codes and Performance analyses

ICAR PT RF0918

Laboratory Name	

A

	Your participation Codes				
Subscription	Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	$SCC_{ref/alt}$
	Yes	Yes	Yes	Yes	Yes
Participation Codes	1	1	1	1	1
Are all the sample results received?	Yes	Yes	Yes	Yes	Yes

--

B

Data results received on time	
Yes	14-09-2018

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	[illegible]	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	1
%	53	88	31	9	6%
d	0.004	[illegible]	0.028	0.004	2%
Sd	0.009	[illegible]	0.014	0.386	2%
D	0.010	0.047	0.032	0.386	2%
Method	ISO 1211|IDF 1	ISO 8968-1 IDF 20-1	IDF 214	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		[illegible]			
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	0.006	0.001	0.000	0.215	10
Sample 2	0.004	0.001	0.010	0.215	5
Sample 3	0.009	0.003	0.010	0.430	0.000
Sample 4	0.004	0.008	0.020	0.215	0.000
Sample 5	0.004	0.001	0.010	0.215	5
Sample 6	0.002	0.003	0.010	0.215	5
Sample 7	0.001	0.000	0.000	0.215	0.000
Sample 8	0.002	0.006	0.000	0.430	10
Sample 9	0.002	0.000	0.050	0.215	20
Sample 10	0.006	0.003	0.010	0.430	10

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	0.074	-5.807	-0.379	1.300	-0.74
Sample 2	0.587	-2.310	-0.593	0.551	-0.49
Sample 3	0.944	-1.766	-1.012	-0.111	-0.29
Sample 4	-0.262	-1.908	-0.565	-0.320	-0.37
Sample 5	1.532	1.940	-0.643	-0.889	0.13
Sample 6	-0.053	-2.023	-0.409	-0.246	-0.24
Sample 7	1.102	-1.922	-0.529	-0.194	-0.01
Sample 8	-0.441	-0.382	-0.505	0.360	0.00
Sample 9	-0.113	0.000	0.053	0.157	-0.15
Sample 10	0.396	-1.144	-0.678	-0.228	-0.05

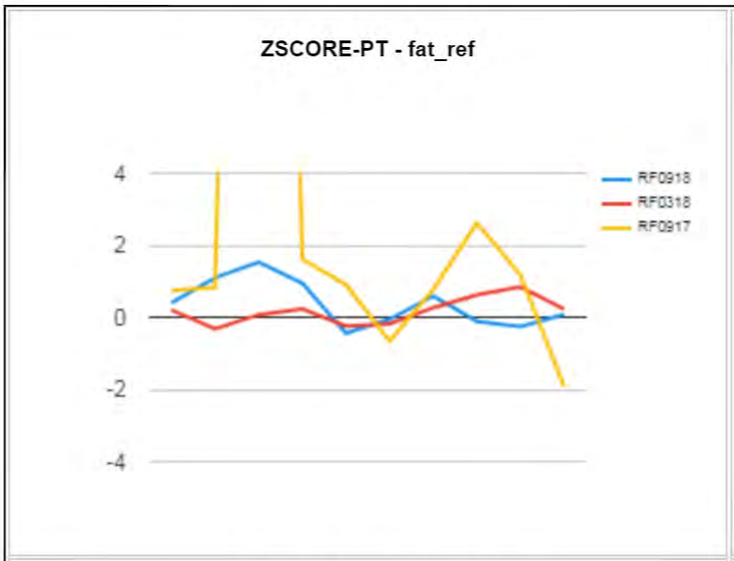
Your Z-Score Fix

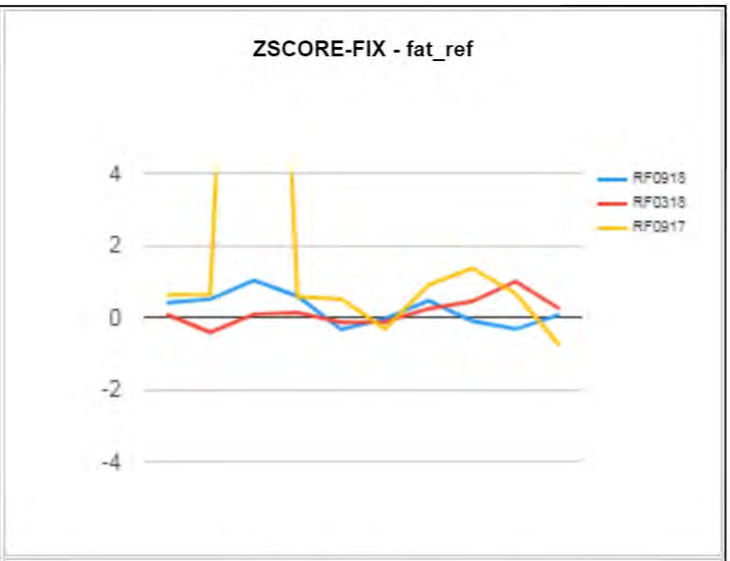
	Fat	Protein	Lactose	Urea	SCC
Sample 1	0.073	-4.637	-0.685	0.390	-1.84
Sample 2	0.462	-1.543	-0.769	0.190	-1.04
Sample 3	0.587	-1.700	-0.983	-0.095	-0.61
Sample 4	-0.330	-3.373	-0.592	-0.091	-0.73
Sample 5	1.022	2.874	-0.590	-0.119	0.30
Sample 6	-0.046	-2.563	-0.371	-0.188	-0.51
Sample 7	0.500	-1.928	-0.683	-0.045	-0.01
Sample 8	-0.335	-0.412	-0.554	0.129	0.00
Sample 9	-0.102	0.000	0.056	0.175	-0.38
Sample 10	0.398	-1.012	-0.890	-0.323	-0.14

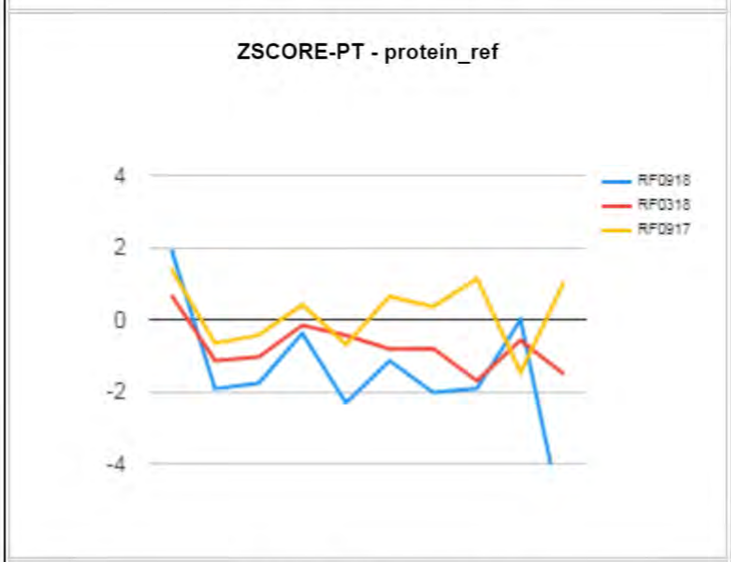
If there is a sample with a "z-score" in the yellow or red area please check table VI and VII in correspondence of your lab code.

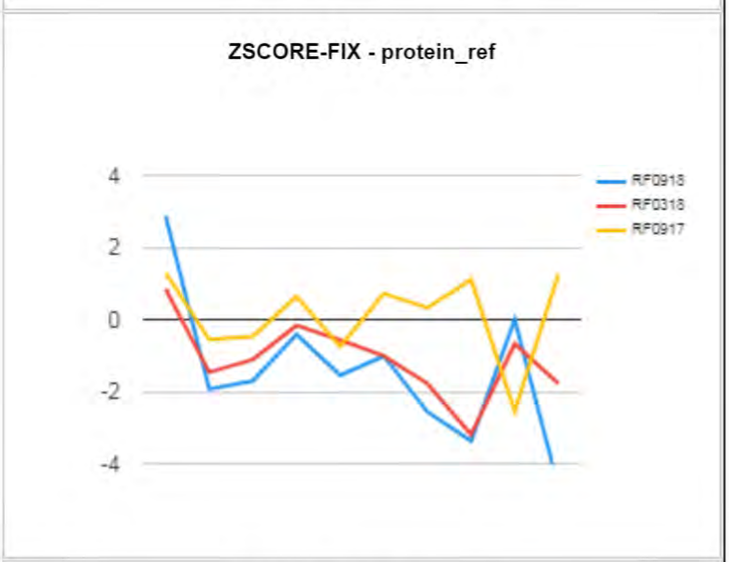
Interpretation Z-Score

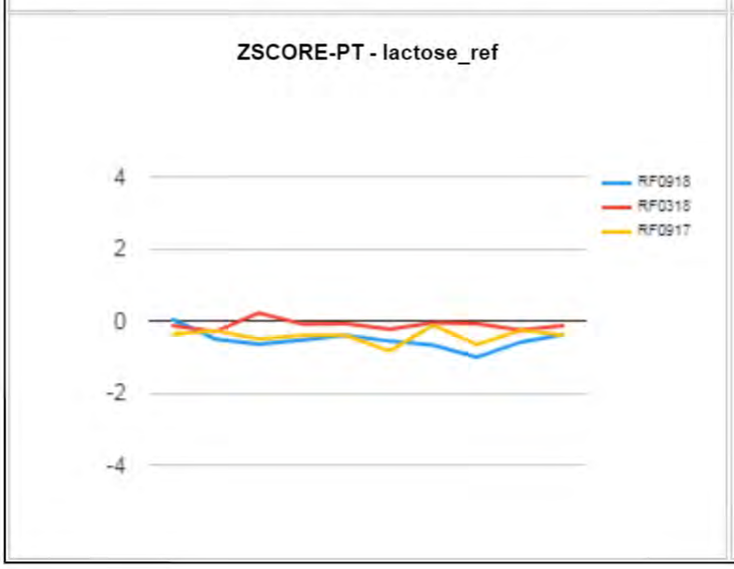
Z-Score<-3	-3<Z-Score<-2	-2<Z-Score<2	2<Z-Score<3	Z-Score>3
Poor	Moderate	Good	Moderate	Poor

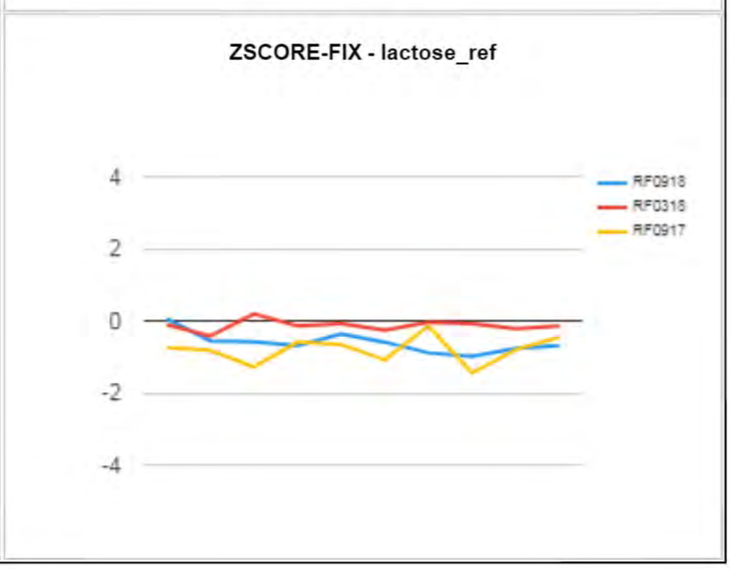

ZSCORE-PT - fat_ref
4
2
0
-2
-4
RF0918
RF0318
RF0917

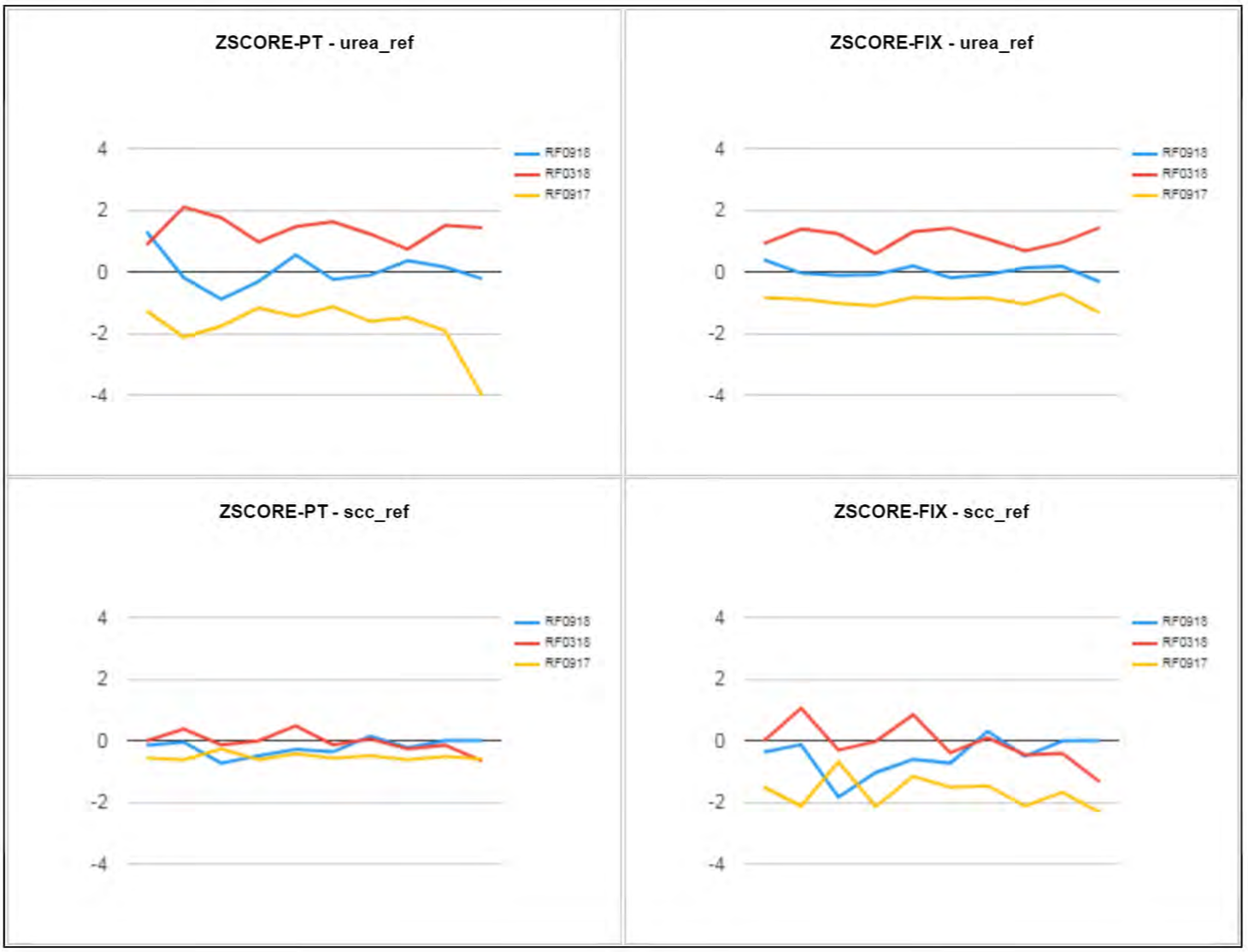

ZSCORE-FIX - fat_ref
4
2
0
-2
-4
RF0918
RF0318
RF0917


ZSCORE-PT - protein_ref
4
2
0
-2
-4
RF0918
RF0318
RF0917


ZSCORE-FIX - protein_ref
4
2
0
-2
-4
RF0918
RF0318
RF0917


ZSCORE-PT - lactose_ref
4
2
0
-2
-4
RF0918
RF0318
RF0917


ZSCORE-FIX - lactose_ref
4
2
0
-2
-4
RF0918
RF0318
RF0917


ZSCORE-PT - urea_ref
4
2
0
-2
-4
RF0918
RF0318
RF0917
ZSCORE-FIX - urea_ref
4
2
0
-2
-4
RF0918
RF0318
RF0917
ZSCORE-PT - scc_ref
4
2
0
-2
-4
RF0918
RF0318
RF0917
ZSCORE-FIX - scc_ref
4
2
0
-2
-4
RF0918
RF0318
RF0917

Chemical Reference Methods
Laboratory participation codes and Performance analyses

ICAR PT RF0918

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					30
Are all the sample results received?	No	No	No	No	Yes

B

Data results received on time	
Yes	14-09-2018

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					30
%					9%
d					2%
Sd					2%
D					2%
Method					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					
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					10
Sample 2					5
Sample 3					0.000
Sample 4					0.000
Sample 5					5
Sample 6					5
Sample 7					0.000
Sample 8					10
Sample 9					20
Sample 10					10

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					-0.74
Sample 2					-0.49
Sample 3					-0.29
Sample 4					-0.37
Sample 5					0.13
Sample 6					-0.24
Sample 7					-0.01
Sample 8					0.00
Sample 9					-0.15
Sample 10					-0.05

Your Z-Score Fix

	Fat	Protein	Lactose	Urea	SCC
Sample 1					-1.84
Sample 2					-1.04
Sample 3					-0.61
Sample 4					-0.73
Sample 5					0.30
Sample 6					-0.51
Sample 7					-0.01
Sample 8					0.00
Sample 9					-0.38
Sample 10					-0.14

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
4
2
0
-2
-4
RF0916
RF0316
RF0917
ZSCORE-FIX - scc_ref
4
2
0
-2
-4
RF0916
RF0316
RF0917

ICAR
PROFICIENCY TESTING SCHEME

September 2018

Raw Milk

Determination of FAT CONTENT
Röse Gottlieb method

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

Proficiency test accreditated ISO 17043

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

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

Nb	%	N°	ig d	Sd	D	Method
1	6	10	+ 0.003	0.003	0.004	A
2	12	3	+ 0.003	0.003	0.005	A
3	18	7	- 0.000	0.005	0.005	A
4	24	9	+ 0.003	0.004	0.005	A
5	29	11	- 0.000	0.007	0.007	A
6	35	16	+ 0.001	0.007	0.007	A
7	41	14	- 0.006	0.004	0.008	A
8	47	13	- 0.007	0.004	0.008	A
9	53	1	+ 0.004	0.009	0.010	A
10	59	4	- 0.010	0.014	0.017	A
11	65	2	- 0.005	0.017	0.017	A
12	71	12	- 0.013	0.013	0.018	A
13	76	8	+ 0.010	0.018	0.021	A
14	82	15	+ 0.009	0.031	0.032	B
15	88	17	- 0.002	0.034	0.034	B
16	94	6	- 0.025	0.024	0.034	B
17	100	5	+ 0.031	0.017	0.036	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 14 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
B ISO 2446|IDF 226 Gerber 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}	0.005
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	0.006	0.004	0.009	0.004	0.004	0.002	0.001	0.002	0.002	0.006	0.003	20
2	0.009	0.002	0.002	0.003	0.013	0.017	0.003	0.005	0.004	0.000	0.006	20
3	0.001	0.007	0.004	0.008	0.005	0.008	0.003	0.005	0.005	0.002	0.004	20
4	0.005	0.011	0.005	0.013	0.002	0.007	0.004	0.013	0.003	0.011	0.006	20
5	0.020	0.010	0.020	0.000	0.030 *	0.020	0.030 *	0.010	0.000	0.020 *	0.013	20
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	20
7	0.004	0.008	0.011	0.006	0.002	0.010	0.005	0.007	0.002	0.003	0.005	20
8	0.009	0.012	0.008	0.004	0.003	0.006	0.000	0.002	0.002	0.001	0.004	20
9	0.006	0.009	0.019	0.005	0.008	0.008	0.001	0.000	0.004	0.005	0.006	20
10	0.017	0.011	0.002	0.002	0.013	0.001	0.006	0.012	0.014	0.005	0.007	20
11	0.006	0.006	0.003	0.012	0.002	0.004	0.003	0.011	0.007	0.009	0.005	20
12	0.004	0.015	0.003	0.003	0.001	0.006	0.005	0.000	0.000	0.003	0.004	20
13	0.001	0.003	0.000	0.008	0.006	0.002	0.006	0.005	0.007	0.003	0.003	20
14	0.010	0.005	0.015	0.001	0.017	0.009	0.003	0.024	0.009	0.008	0.009	20
15	0.010	0.019	0.019	0.029 *	0.000	0.010	0.000	0.019	0.000	0.000	0.010	20
16	0.010	0.000	0.010	0.010	0.010	0.010	0.010	0.000	0.000	0.000	0.005	20
17	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	20
Sr	0.006	0.006	0.007	0.007	0.007	0.006	0.006	0.007	0.004	0.005		340
NE	34	34	34	34	34	34	34	34	34	34		
L	0.025	0.024	0.028	0.017	0.020	0.024	0.011	0.026	0.014	0.013		

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 1

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	4.822	3.531	2.865	4.212	2.178	3.260	1.774	2.926	3.610	1.503
2	4.833	3.532	2.859	4.178	2.150	3.271	1.762	2.930	3.591	1.483
3	4.823	3.528	2.859	4.221	2.161	3.266	1.763	2.939	3.619	1.492
4	4.781	3.508	2.853	4.208	2.163	3.265	1.762	2.917	3.592	1.495
5	4.860	3.545	2.920 *	4.260	2.165	3.300	1.775	2.955	3.640	1.530
6	4.850	3.500	2.820	4.170	2.140	3.200 *	1.750	2.910	3.590	1.460
7	4.821	3.528	2.857	4.222	2.158	3.256	1.766	2.924	3.608	1.493
8	4.861	3.510	2.858	4.258	2.152	3.252	1.764	2.948	3.626	1.504
9	4.816	3.524	2.855	4.221	2.163	3.261	1.762	2.944	3.618	1.499
10	4.823	3.527	2.853	4.222	2.166	3.261	1.764	2.935	3.618	1.495
11	4.820	3.525	2.854	4.227	2.158	3.269	1.763	2.924	3.613	1.483
12	4.813	3.499	2.848	4.217	2.148	3.224	1.766	2.925	3.605	1.465
13	4.815	3.515	2.842	4.208	2.148	3.255	1.750	2.927	3.612	1.492
14	4.811	3.516	2.840	4.217	2.152	3.252	1.756	2.932	3.604	1.495
15	4.840	3.583 *	2.826	4.258	2.136	3.296	1.748	2.923	3.641	1.476
16	4.815	3.520	2.845	4.215	2.155	3.265	1.765	2.940	3.620	1.510
17	4.815	3.560	2.860	4.250	2.120	3.270	1.740	2.890	3.570	1.540
M	4.824	3.523	2.849	4.221	2.154	3.264	1.760	2.929	3.610	1.495
REF.	4.821	3.522	2.853	4.219	2.158	3.261	1.763	2.933	3.612	1.495
SD	0.020	0.016	0.012	0.025	0.013	0.017	0.009	0.015	0.018	0.020

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 14 laboratories using the reference method ISO 1211 | IDF 1, 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				15	5		5			5
Outliers Grubbs		15	5			6				
Sr	0.006	0.006	0.007	0.005	0.005	0.006	0.003	0.007	0.004	0.003
SR	0.020	0.016	0.013	0.024	0.014	0.018	0.009	0.016	0.018	0.019

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	+ 0.001	+ 0.009	+ 0.012	- 0.007	+ 0.020	- 0.001	+ 0.010	- 0.007	- 0.002	+ 0.008	+ 0.004	0.009	1.60
2	+ 0.012	+ 0.010	+ 0.006	- 0.041	- 0.008	+ 0.010	- 0.002	- 0.003	- 0.021	- 0.012	- 0.005	0.017	0.94
3	+ 0.002	+ 0.006	+ 0.006	+ 0.002	+ 0.003	+ 0.005	- 0.001	+ 0.006	+ 0.006	- 0.003	+ 0.003	0.003	3.17
4	- 0.040	- 0.014	- 0.000	- 0.011	+ 0.005	+ 0.004	- 0.001	- 0.016	- 0.021	- 0.001	- 0.010	0.014	2.16
5	+ 0.039	+ 0.023	+ 0.067	+ 0.041	+ 0.007	+ 0.039	+ 0.012	+ 0.022	+ 0.028	+ 0.035	+ 0.031	0.017	5.79
6	+ 0.029	- 0.022	- 0.033	- 0.049	- 0.018	- 0.061	- 0.013	- 0.023	- 0.022	- 0.035	- 0.025	0.024	3.23
7	+ 0.000	+ 0.006	+ 0.004	+ 0.003	+ 0.000	- 0.005	+ 0.002	- 0.009	- 0.004	- 0.003	- 0.000	0.005	0.29
8	+ 0.040	- 0.012	+ 0.005	+ 0.039	- 0.006	- 0.009	+ 0.001	+ 0.015	+ 0.014	+ 0.008	+ 0.010	0.018	1.66
9	- 0.005	+ 0.002	+ 0.002	+ 0.002	+ 0.005	+ 0.000	- 0.002	+ 0.011	+ 0.006	+ 0.003	+ 0.003	0.004	1.80
10	+ 0.002	+ 0.005	+ 0.000	+ 0.003	+ 0.008	- 0.000	+ 0.001	+ 0.002	+ 0.006	- 0.001	+ 0.003	0.003	2.87
11	- 0.001	+ 0.003	+ 0.001	+ 0.008	+ 0.000	+ 0.008	- 0.001	- 0.009	+ 0.000	- 0.013	- 0.000	0.007	0.09
12	- 0.008	- 0.023	- 0.005	- 0.002	- 0.010	- 0.037	+ 0.003	- 0.008	- 0.007	- 0.030	- 0.013	0.013	3.10
13	- 0.006	- 0.007	- 0.011	- 0.011	- 0.010	- 0.006	- 0.013	- 0.006	- 0.001	- 0.004	- 0.007	0.004	6.13
14	- 0.010	- 0.006	- 0.013	- 0.002	- 0.006	- 0.009	- 0.008	- 0.001	- 0.009	- 0.000	- 0.006	0.004	4.72
15	+ 0.019	+ 0.061	- 0.027	+ 0.039	- 0.022	+ 0.035	- 0.015	- 0.010	+ 0.029	- 0.019	+ 0.009	0.031	0.91
16	- 0.006	- 0.002	- 0.008	- 0.004	- 0.003	+ 0.004	+ 0.002	+ 0.007	+ 0.008	+ 0.015	+ 0.001	0.007	0.65
17	- 0.006	+ 0.038	+ 0.007	+ 0.031	- 0.038	+ 0.009	- 0.023	- 0.043	- 0.042	+ 0.045	- 0.002	0.034	0.19
d	+ 0.004	+ 0.001	- 0.003	+ 0.003	- 0.004	+ 0.003	- 0.003	- 0.004	- 0.002	- 0.000	- 0.000	0.019	
Sd	0.020	0.016	0.012	0.025	0.013	0.017	0.009	0.015	0.018	0.020	0.017		

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 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	+0.07	+0.59	+0.94	-0.26	+1.53	-0.05	+1.10	-0.44	-0.11	+0.40
2	+0.61	+0.65	+0.50	-1.64	-0.60	+0.55	-0.22	-0.21	-1.17	-0.60
3	+0.10	+0.36	+0.50	+0.10	+0.22	+0.29	-0.11	+0.38	+0.36	-0.15
4	-2.04	-0.90	-0.02	-0.44	+0.41	+0.21	-0.16	-1.07	-1.14	-0.03
5	+2.01	+1.48	+5.40	+1.65	+0.56	+2.25	+1.27	+1.47	+1.55	+1.74
6	+1.50	-1.38	-2.63	-1.93	-1.32	-3.51	-1.49	-1.49	-1.22	-1.74
7	+0.02	+0.40	+0.30	+0.14	+0.03	-0.28	+0.22	-0.61	-0.22	-0.13
8	+2.04	-0.75	+0.42	+1.57	-0.45	-0.51	+0.06	+1.01	+0.77	+0.42
9	-0.23	+0.11	+0.14	+0.08	+0.41	+0.00	-0.22	+0.74	+0.33	+0.17
10	+0.10	+0.30	+0.02	+0.14	+0.59	-0.02	+0.06	+0.15	+0.33	-0.03
11	-0.03	+0.21	+0.06	+0.33	+0.03	+0.47	-0.11	-0.61	+0.03	-0.62
12	-0.39	-1.46	-0.41	-0.08	-0.75	-2.13	+0.33	-0.53	-0.39	-1.51
13	-0.31	-0.46	-0.86	-0.42	-0.72	-0.34	-1.49	-0.41	-0.03	-0.18
14	-0.49	-0.40	-1.06	-0.08	-0.45	-0.54	-0.88	-0.05	-0.47	-0.00
15	+0.99	+3.85	-2.19	+1.55	-1.62	+2.02	-1.71	-0.67	+1.61	-0.95
16	-0.28	-0.11	-0.62	-0.14	-0.19	+0.24	+0.17	+0.48	+0.44	+0.74
17	-0.28	+2.43	+0.58	+1.25	-2.82	+0.52	-2.59	-2.81	-2.33	+2.24

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

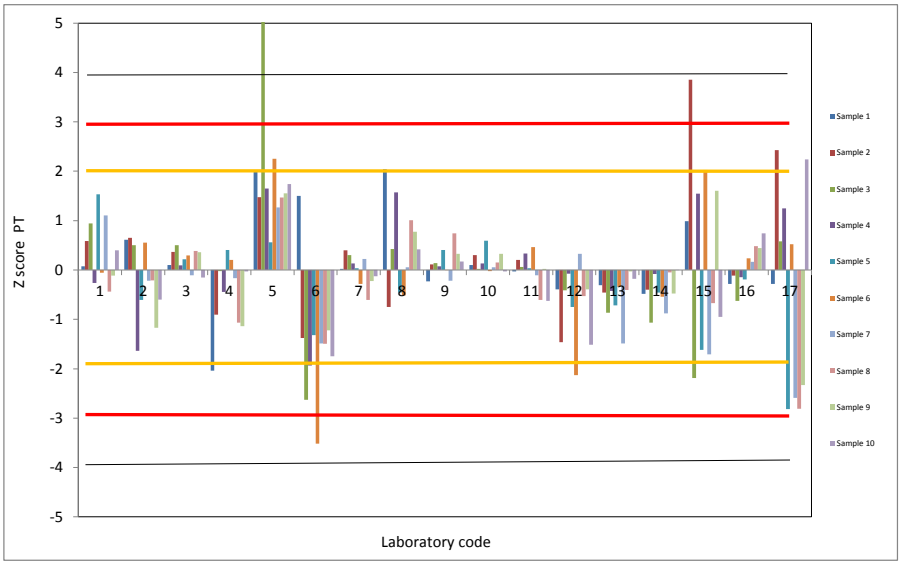


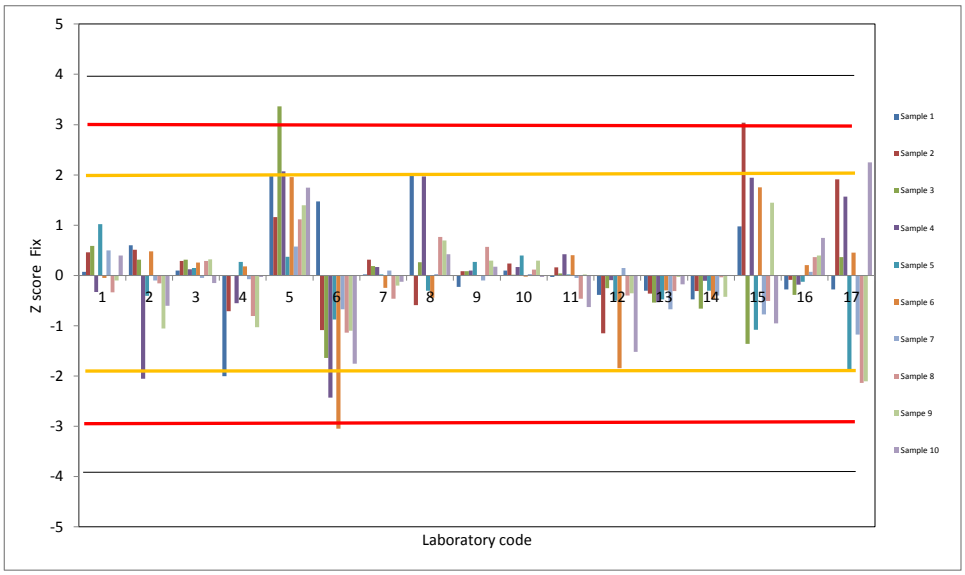
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+0.07	+0.46	+0.59	-0.33	+1.02	-0.05	+0.50	-0.33	-0.10	+0.40
2	+0.60	+0.51	+0.31	-2.05	-0.40	+0.48	-0.10	-0.16	-1.05	-0.60
3	+0.10	+0.29	+0.31	+0.12	+0.15	+0.25	-0.05	+0.29	+0.32	-0.15
4	-2.00	-0.71	-0.01	-0.55	+0.27	+0.18	-0.07	-0.81	-1.03	-0.03
5	+1.97	+1.16	+3.36	+2.07	+0.37	+1.95	+0.58	+1.12	+1.40	+1.75
6	+1.47	-1.09	-1.64	-2.43	-0.88	-3.05	-0.67	-1.13	-1.10	-1.75
7	+0.02	+0.31	+0.19	+0.17	+0.02	-0.25	+0.10	-0.46	-0.20	-0.13
8	+2.00	-0.59	+0.26	+1.97	-0.30	-0.45	+0.03	+0.77	+0.70	+0.42
9	-0.23	+0.09	+0.09	+0.10	+0.27	+0.00	-0.10	+0.57	+0.30	+0.17
10	+0.10	+0.24	+0.01	+0.17	+0.40	-0.02	+0.03	+0.12	+0.30	-0.03
11	-0.03	+0.16	+0.04	+0.42	+0.02	+0.40	-0.05	-0.46	+0.02	-0.63
12	-0.39	-1.15	-0.26	-0.10	-0.50	-1.84	+0.15	-0.40	-0.35	-1.52
13	-0.30	-0.36	-0.54	-0.53	-0.48	-0.30	-0.67	-0.31	-0.03	-0.18
14	-0.48	-0.31	-0.66	-0.10	-0.30	-0.47	-0.40	-0.03	-0.43	-0.00
15	+0.97	+3.04	-1.36	+1.95	-1.08	+1.75	-0.77	-0.51	+1.45	-0.95
16	-0.28	-0.09	-0.39	-0.18	-0.13	+0.20	+0.08	+0.37	+0.40	+0.75
17	-0.28	+1.91	+0.36	+1.57	-1.88	+0.45	-1.17	-2.13	-2.10	+2.25

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



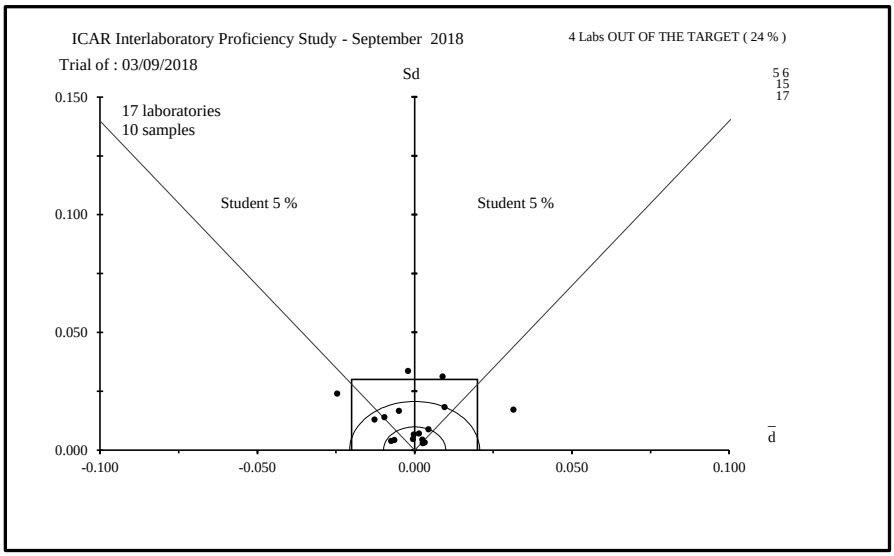


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST

RAW MILK
FAT CONTENT Röse Göttlieb
Sep 18

Name	City	Country
Actalia	Poligny	France
Agroscope Institute for food Sciences IFS	Bern-Liebefeld	Switzerland
Alip	Sousada	Portugal
Central Milk Lab ICBA	Caesarea	Israel
Department Valorisation des productions Agricoles	Gembloux	Belgium
Eastern Lab services	Medina	USA
Japan Dairy Technical Association	Tokyo	Japan
Lab Agroalimentario de Santander	Santander Ca	Spain
Laboratorio Standard Latte	Maccarese (R	Italy
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Pruszkow	Poland
Milchprüfring Baden-Württemberg e.V.	Kirchheim unt	Germany
Pieno Tyrimai	Kaunas	Lithuania
Qlip B.V.,	Zutphen	NL
Teagasc Food research Center	Cork	IR
Univ. of Ljubljana Biotechnical faculty dept. of Animal Sc. Inst. of Dairy Science and Probiotics	Domzale	Slovenia
Valacta - Centre d'Expertise en Production Laitière du Québec	Quebec	Canada
Valio Oy/Seinajoen aluelaboratorio	Seinajoki	Finland

ICAR
PROFICIENCY TESTING SCHEME

September 2018

Raw Milk

Determination of CRUDE PROTEIN CONTENT
KJELDAHL 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

Proficiency test accreditated ISO 17043

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

Nb	%	N°	ig d	Sd	D	Method
1	6	2	- 0.002	0.005	0.006	A
2	13	3	+ 0.000	0.008	0.008	A
3	19	12	- 0.005	0.007	0.009	A
4	25	15	+ 0.004	0.008	0.009	A
5	31	6	- 0.007	0.006	0.009	A
6	38	7	- 0.000	0.010	0.010	A
7	44	10	- 0.006	0.010	0.012	A
8	50	9	+ 0.012	0.008	0.014	A
9	56	13	+ 0.015	0.006	0.016	A
10	63	11	- 0.015	0.009	0.017	B
11	69	5	+ 0.011	0.016	0.019	A
12	75	8	+ 0.030	0.033	0.044	B
13	81	4	- 0.044	0.009	0.045	A
14	88	1	- 0.029	0.038	0.047	A
15	94	16	- 0.038	0.033	0.050	A
16	100	14	+ 11.27	25.091	27.505	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 :

+/- 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 13 laboratories using the reference method (ISO 8968-1|IDF 20-1), after outlier discarging using Grubbs test at 5% risk level

N.B. : N° 10 : ISO 8196-3 modified and N° 12; 16 : ISO 8196-3

(NC : OUT of RANKING because of insufficient data number)
(Nb : laboratory rank; % : relative rank)

A ISO 8968-1|IDF 20-1
B ISO 8968-3|IDF 20-3

(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}	0.020

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0.001	0.001	0.003	0.008	0.001	0.003	0.000	0.006	**	0.003	0.003	18
2	0.011	0.000	0.002	0.027	0.004	0.004	0.002	0.000	0.008	0.006	0.007	20
3	0.000	0.000	0.006	0.000	0.006	0.000	0.006	0.006	0.006	0.006	0.003	20
4	0.000	0.020	0.000	0.002	0.004	0.005	0.003	0.002	0.002	0.005	0.005	20
5	0.013	0.027	0.003	0.009	0.004	0.024	0.008	0.055 *	0.003	0.048 *	0.019	20
6	0.002	0.011	0.000	0.010	0.004	0.001	0.004	0.003	0.011	0.004	0.004	20
7	0.014	0.016	0.004	0.019	0.008	0.020	0.011	0.007	0.020	0.001	0.010	20
8	0.007	0.001	0.014	0.002	0.006	0.004	0.003	0.002	0.012	0.001	0.005	20
9	0.011	0.015	0.005	0.003	0.005	0.006	0.010	0.002	0.001	0.013	0.006	20
10	0.001	0.001	0.008	0.010	0.004	0.009	0.015	0.009	0.006	0.001	0.006	20
11	0.002	0.002	0.000	0.003	0.006	0.010	0.036 *	0.003	0.016	0.006	0.009	20
12	0.006	0.000	0.000	0.026	0.006	0.013	0.000	0.000	0.006	0.006	0.007	20
13	0.001	0.001	0.012	0.009	0.003	0.001	0.002	0.000	0.009	0.001	0.004	20
14	0.024	0.002	0.207 *	0.011	**	**	**	0.376 *	**	**	0.136	10
15	0.019	0.000	0.006	0.000	0.000	0.000	0.000	0.006	0.006	0.019	0.007	20
16	0.020	0.010	0.020	0.010	0.000	0.030	0.020	0.010	0.010	0.020	0.012	20
Sr	0.008	0.008	0.037	0.009	0.003	0.009	0.009	0.067	0.007	0.011		308
NE	32	32	32	32	30	30	30	32	28	30		
L	0.031	0.029	0.021	0.033	0.013	0.033	0.022	0.014	0.026	0.024		

Sr : repeatability standard deviation of each laboratory limit 0,014 g /100g
NL : number of measurements per laboratory
L : Limit for difference between duplicates according Cochran test at 5% level.
SE : repeatability standard deviation per sample
NE : number of measurements per sample
*: discarded data using the test of Cochran at 5 %
** : missing data
r : limit of repeatability, absolute difference betwen two replicates=0,040 accordingISO 8968-1 | IDF 20-1

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	3.730 *	3.306	2.920	3.555	2.821	3.438	2.859	3.139		3.333
2	3.807	3.327	2.953	3.607	2.760	3.488	2.893	3.143	3.714	3.351
3	3.802	3.330	2.951	3.617	2.772	3.503	2.893	3.142	3.704	3.353
4	3.753 *	3.277 *	2.912	3.568	2.720	3.450	2.852	3.100	3.677	3.315
5	3.829	3.331	2.954	3.610	2.776	3.483	2.903	3.193	3.718	3.378
6	3.796	3.323	2.942	3.602	2.756	3.480	2.890	3.141	3.712	3.354
7	3.801	3.337	2.957	3.625	2.750	3.495	2.897	3.145	3.704	3.353
8	3.807	3.334	2.978	3.668	2.830	3.584 *	2.916	3.158	3.718	3.368
9	3.830	3.342	2.967	3.632	2.775	3.507	2.900	3.158	3.728	3.348
10	3.804	3.319	2.954	3.610	2.758	3.497	2.872	3.141	3.705	3.341
11	3.793	3.322	2.947	3.613	2.755	3.469	2.882	3.127	3.677	3.333
12	3.806	3.324	2.948	3.592	2.766	3.483	2.890	3.145	3.710	3.353
13	3.820	3.345	2.964	3.635	2.778	3.508	2.912	3.157	3.732	3.363
14	3.827	3.349	3.084 *	3.642				59.30 *		
15	3.831	3.343	2.944	3.611	2.763	3.490	2.903	3.15	3.716	3.353
16	3.790	3.245 *	2.930	3.545	2.760	3.445	2.880	3.15	3.685	3.260 *
M	3.810	3.331	2.948	3.608	2.769	3.481	2.889	3.146	3.707	3.350
REF.	3.813	3.333	2.950	3.616	2.769	3.484	2.894	3.146	3.710	3.351
SD	0.014	0.012	0.017	0.032	0.027	0.023	0.018	0.019	0.017	0.016

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 13 laboratories using the reference method ISO 8968-1 | IDF 20-1, 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				7	5; 14		5
Outliers Grubbs	1; 4	4; 16	14			8		14		16
Sr	0.009	0.007	0.006	0.009	0.003	0.009	0.006	0.004	0.007	0.005
SR	0.016	0.013	0.018	0.032	0.027	0.024	0.019	0.015	0.018	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	- 0.083	- 0.028	- 0.031	- 0.061	+ 0.052	- 0.046	- 0.035	- 0.007		- 0.018	- 0.029	0.038	2.27
2	- 0.006	- 0.006	+ 0.003	- 0.009	- 0.009	+ 0.004	- 0.001	- 0.004	+ 0.004	+ 0.000	- 0.002	0.005	1.42
3	- 0.010	- 0.003	+ 0.001	+ 0.002	+ 0.003	+ 0.019	- 0.000	- 0.004	- 0.007	+ 0.002	+ 0.000	0.008	0.08
4	- 0.060	- 0.056	- 0.038	- 0.048	- 0.049	- 0.034	- 0.042	- 0.046	- 0.033	- 0.036	- 0.044	0.009	15.27
5	+ 0.016	- 0.003	+ 0.004	- 0.005	+ 0.007	- 0.001	+ 0.009	+ 0.046	+ 0.007	+ 0.027	+ 0.011	0.016	2.18
6	- 0.017	- 0.010	- 0.008	- 0.013	- 0.013	- 0.004	- 0.004	- 0.005	+ 0.001	+ 0.004	- 0.007	0.006	3.41
7	- 0.012	+ 0.004	+ 0.007	+ 0.009	- 0.019	+ 0.011	+ 0.003	- 0.002	- 0.006	+ 0.002	- 0.000	0.010	0.12
8	- 0.006	+ 0.001	+ 0.028	+ 0.052	+ 0.061	+ 0.100	+ 0.023	+ 0.012	+ 0.008	+ 0.017	+ 0.030	0.033	2.86
9	+ 0.017	+ 0.009	+ 0.017	+ 0.017	+ 0.007	+ 0.023	+ 0.006	+ 0.011	+ 0.018	- 0.003	+ 0.012	0.008	5.01
10	- 0.009	- 0.015	+ 0.004	- 0.005	- 0.011	+ 0.013	- 0.021	- 0.006	- 0.005	- 0.010	- 0.006	0.010	2.10
11	- 0.020	- 0.012	- 0.003	- 0.002	- 0.014	- 0.014	- 0.011	- 0.020	- 0.033	- 0.018	- 0.015	0.009	5.28
12	- 0.007	- 0.009	- 0.003	- 0.024	- 0.003	- 0.000	- 0.004	- 0.001	- 0.000	+ 0.002	- 0.005	0.007	2.09
13	+ 0.007	+ 0.012	+ 0.014	+ 0.020	+ 0.009	+ 0.024	+ 0.018	+ 0.010	+ 0.021	+ 0.013	+ 0.015	0.006	8.23
14	+ 0.014	+ 0.016	+ 0.134	+ 0.026				+ 56.15			+ 11.27	25.091	1.00
15	+ 0.018	+ 0.010	- 0.006	- 0.005	- 0.006	+ 0.006	+ 0.009	+ 0.01	+ 0.006	+ 0.002	+ 0.004	0.008	1.73
16	- 0.023	- 0.088	- 0.020	- 0.071	- 0.009	- 0.039	- 0.014	- 0.00	- 0.025	- 0.091	- 0.038	0.033	3.63
d	- 0.003	- 0.002	- 0.002	- 0.007	+ 0.000	- 0.003	- 0.004	- 0.001	- 0.003	- 0.001	+ 0.348	4.525	
Sd	0.014	0.012	0.017	0.032	0.027	0.023	0.018	0.019	0.017	0.016	0.020		

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 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	-5.81	-2.31	-1.77	-1.91	+1.94	-2.02	-1.92	-0.38		-1.14
2	-0.44	-0.51	+0.17	-0.29	-0.33	+0.19	-0.04	-0.19	+0.23	+0.02
3	-0.73	-0.24	+0.04	+0.05	+0.13	+0.83	-0.02	-0.22	-0.39	+0.12
4	-4.17	-4.68	-2.20	-1.50	-1.83	-1.50	-2.34	-2.39	-1.96	-2.28
5	+1.11	-0.22	+0.20	-0.17	+0.27	-0.03	+0.51	+2.38	+0.43	+1.73
6	-1.15	-0.85	-0.48	-0.42	-0.47	-0.17	-0.23	-0.27	+0.08	+0.22
7	-0.83	+0.31	+0.40	+0.28	-0.70	+0.50	+0.16	-0.10	-0.37	+0.11
8	-0.44	+0.05	+1.62	+1.65	+2.28	+4.40	+1.25	+0.62	+0.45	+1.09
9	+1.16	+0.77	+0.96	+0.53	+0.24	+1.03	+0.35	+0.59	+1.07	-0.20
10	-0.60	-1.22	+0.24	-0.17	-0.41	+0.58	-1.19	-0.29	-0.30	-0.60
11	-1.42	-0.97	-0.19	-0.08	-0.51	-0.62	-0.64	-1.02	-1.94	-1.14
12	-0.51	-0.77	-0.15	-0.75	-0.11	-0.01	-0.20	-0.06	-0.02	+0.12
13	+0.47	+1.00	+0.83	+0.62	+0.34	+1.06	+0.99	+0.54	+1.26	+0.79
14	+1.00	+1.32	+7.72	+0.82				+2892		
15	+1.27	+0.82	-0.33	-0.15	-0.23	+0.27	+0.51	+0.44	+0.36	+0.12
16	-1.60	-7.34	-1.16	-2.22	-0.33	-1.69	-0.76	-0.07	-1.49	-5.70

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

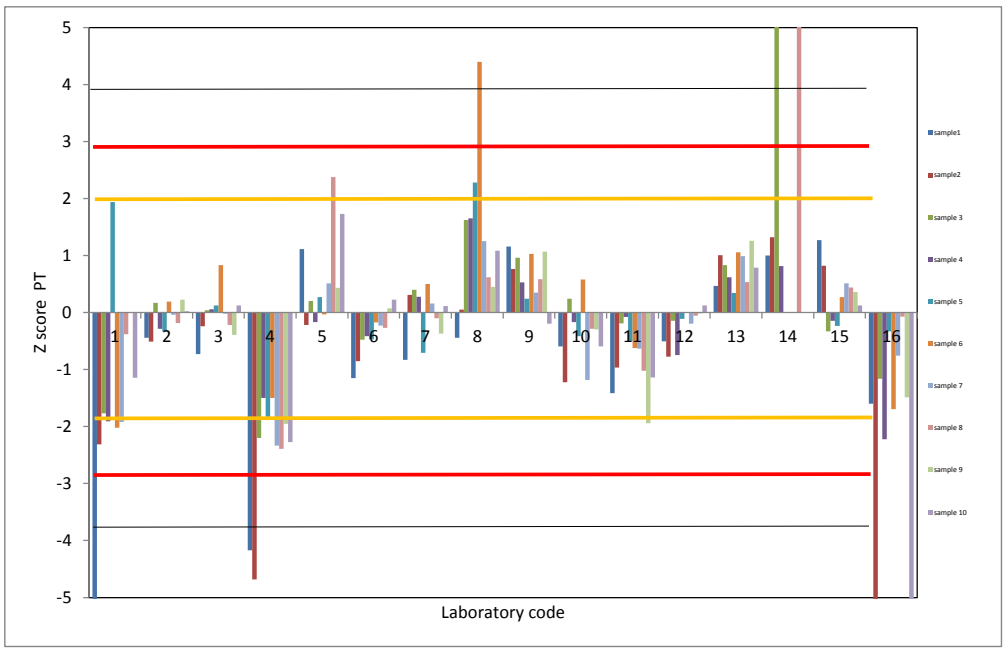


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

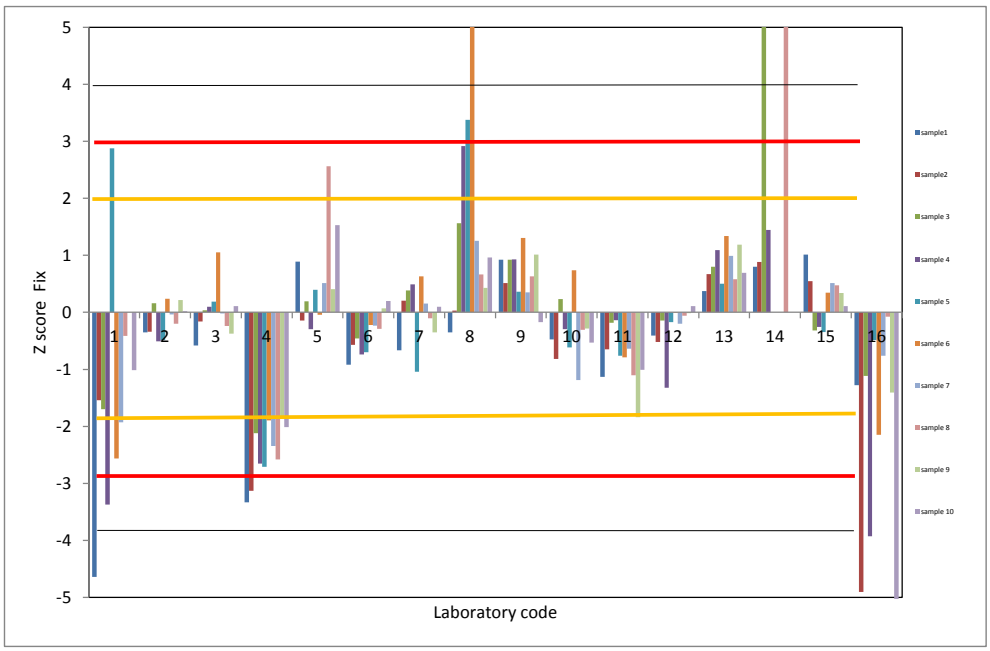
Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-4.64	-1.54	-1.70	-3.37	+2.87	-2.56	-1.93	-0.41		-1.01
2	-0.35	-0.34	+0.16	-0.51	-0.49	+0.24	-0.04	-0.20	+0.21	+0.02
3	-0.58	-0.16	+0.04	+0.10	+0.19	+1.05	-0.02	-0.24	-0.37	+0.11
4	-3.33	-3.13	-2.12	-2.65	-2.71	-1.90	-2.34	-2.58	-1.85	-2.01
5	+0.89	-0.14	+0.20	-0.29	+0.40	-0.04	+0.51	+2.56	+0.41	+1.53
6	-0.92	-0.57	-0.46	-0.74	-0.70	-0.22	-0.23	-0.29	+0.07	+0.20
7	-0.66	+0.21	+0.38	+0.49	-1.04	+0.63	+0.16	-0.11	-0.35	+0.10
8	-0.35	+0.03	+1.56	+2.91	+3.38	+5.57	+1.26	+0.67	+0.43	+0.96
9	+0.92	+0.51	+0.92	+0.93	+0.36	+1.30	+0.35	+0.63	+1.01	-0.17
10	-0.48	-0.82	+0.23	-0.29	-0.61	+0.74	-1.19	-0.31	-0.28	-0.53
11	-1.13	-0.65	-0.18	-0.14	-0.76	-0.79	-0.64	-1.10	-1.84	-1.01
12	-0.40	-0.52	-0.14	-1.32	-0.17	-0.01	-0.20	-0.06	-0.02	+0.11
13	+0.37	+0.67	+0.80	+1.09	+0.50	+1.34	+0.99	+0.58	+1.19	+0.69
14	+0.80	+0.88	+7.43	+1.44				+3120		
15	+1.01	+0.55	-0.32	-0.26	-0.35	+0.35	+0.51	+0.47	+0.34	+0.11
16	-1.28	-4.90	-1.12	-3.93	-0.49	-2.15	-0.76	-0.08	-1.40	-5.04

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

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



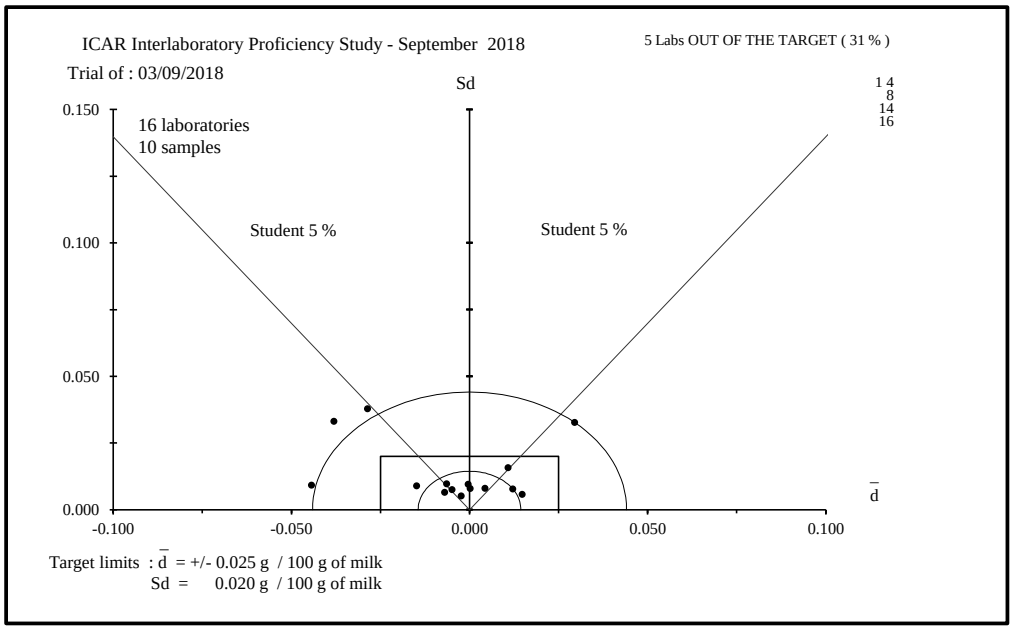


Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST

RAW MILK
PROTEIN CONTENT KJELDAHL
Sep 18

Name	City	Country
Actalia	Poligny	France
Agroscope Institute for food Sciences IFS	Bern-Liebefel	Switzerland
Alip	Sousada	Portugal
Central Milk Lab ICBA	Caesarea	Israel
Department Valorisation des productions Agricoles	Gembloux	Belgium
Eastern Lab services	Medina	USA
Japan Dairy Technical Association	Tokyo	Japan
Lab Agroalimentario de Santander	Santander C	Spain
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Pruszkow	Poland
Milchprüfring Baden-Württemberg e.V.	Kirchheim ur	Germany
Pieno Tyrimai	Kaunas	Lithuania
Qlip B.V.,	Zutphen	NL
Teagasc Food research Center	Cork	IR
Univ. of Ljubljana Biotechnical faculty dept. of Animal Sc. Inst. of Dairy Science and Probiotics	Domzale	Slovenia
Valacta - Centre d'Expertise en Production Laitière du Québec	Quebec	Canada
Valio Oy/Seinajoen aluelaboratorio	Seinajoki	Finland
Vetlab Agricultural Showgrouds	Lusaka	Zambia

ICAR
PROFICIENCY TESTING SCHEME

September 2018

Raw Milk

Determination of LACTOSE CONTENT

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

Nb	%	N°	ig d	Sd	D	**Method**
1	8	2	+ 0.005	0.013	0.013	Own method
2	15	9	+ 0.012	0.014	0.018	IDF 214
3	23	7	+ 0.019	0.012	0.022	IDF 198
4	31	1	- 0.028	0.014	0.032	IDF 214
5	38	5	- 0.024	0.028	0.037	IDF 214
6	46	8	+ 0.022	0.037	0.043	IDF 214
7	54	4	+ 0.006	0.046	0.046	Enzymatic method
8	62	6	- 0.045	0.018	0.048	IDF 198
9	69	12	+ 0.050	0.017	0.053	IDF 198
10	77	10	+ 0.056	0.024	0.061	Titration method
11	85	13	- 0.070	0.014	0.071	IDF 214
12	92	3	+ 0.064	0.033	0.072	Polarimeter
13	100	11	- 0.092	0.066	0.113	continuous flow analysis

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 :

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 13 laboratories , after outliers 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}	0.011
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0.055

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

Sample / Lab Code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0.000	0.010	0.010	0.020	0.010	0.010	0.000	0.000	0.050 *	0.010	0.013	20
2	0.012	0.007	0.003	0.008	0.001	0.010	0.005	0.001	0.007	0.003	0.005	20
3	0.010	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.003	20
4	0.000	0.018	0.033	0.037	0.017	0.017	0.000	0.019	0.019	0.017	0.015	20
5	0.007	0.011	0.006	0.002	0.004	0.005	0.006	0.003	0.006	0.008	0.004	20
6	0.022	0.007	0.018	0.006	0.004	0.022	0.042 *	0.008	0.011	0.015	0.013	20
7	0.005	0.045	0.015	0.001	0.007	0.016	0.008	0.002	0.007	0.008	0.012	20
8	0.034	0.051	0.016	0.006	0.002	0.003	0.003	0.015	0.004	0.001	0.015	20
9	0.025	0.022	0.023	0.009	0.002	0.027	0.025	0.002	0.019	0.015	0.014	20
10	0.006	0.000	0.020	0.013	0.033	0.001	0.006	0.016	0.011	0.009	0.010	20
11	0.010	0.010	0.031	0.018	0.025	0.026	0.058 *	0.019	0.019	0.029	0.020	20
12	0.000	0.012	0.001	0.005	0.013	0.006	0.014	0.008	0.000	0.004	0.006	20
13	0.011	0.040	0.015	0.034	0.028	0.047	0.015	0.030	0.010	0.054 *	0.023	20
Sr	0.010	0.017	0.013	0.012	0.011	0.014	0.016	0.009	0.013	0.014		260
NE	26	26	26	26	26	26	26	26	26	26		
L	0.038	0.063	0.046	0.043	0.040	0.051	0.026	0.034	0.029	0.032		

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

NL : number of measurements per laboratory

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

SE : repeatability standard deviation per sample

NE : number of measurements per sample

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

** : missing data

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

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

Sample / Lab Code	1	2	3	4	5	6	7	8	9	10
1	5.030	4.975	4.905	4.750	4.615	4.715	4.650	4.610	4.605	4.825
2	5.092	5.030	4.952	4.767	4.647	4.732	4.678	4.649	4.594	4.873
3	5.185	5.120	5.030	4.840	4.660	4.785	4.730	4.680	4.630	4.940
4	4.970	5.027	4.980	4.791	4.594	4.739	4.750	4.643	4.644	4.895
5	4.988	4.981	4.912	4.717	4.611	4.729	4.680	4.630	4.599	4.880
6	5.050	4.997	4.897	4.722	4.594	4.684	4.632	4.595	4.541	4.806
7	5.109	5.018	4.960	4.785	4.658	4.749	4.704	4.665	4.616	4.889
8	5.171	5.037	4.973	4.814	4.663	4.723	4.716	4.606	4.612	4.872
9	5.098	5.034	4.973	4.777	4.658	4.756	4.679	4.647	4.595	4.872
10	5.100	5.035	4.977	4.854	4.723	4.814	4.719	4.704	4.654	4.952
11	4.879	4.859	4.938	4.766	4.644	4.673	4.544	4.534	4.476	4.733
12	5.089	5.043	4.999	4.836	4.714	4.768	4.745	4.716	4.652	4.909
13	4.996	4.948	4.866	4.695	4.586	4.669	4.594	4.572	4.556	4.786
M	5.058	5.008	4.951	4.778	4.643	4.733	4.678	4.635	4.598	4.864
REF.	5.062	5.011	4.951	4.778	4.643	4.732	4.682	4.636	4.602	4.867
SD	0.085	0.061	0.046	0.049	0.043	0.043	0.061	0.052	0.050	0.062

M = mean per sample REF. = reference values

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 13 laboratories, 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							6; 11			13
Outliers Grubbs										
Sr	0.010	0.017	0.013	0.012	0.011	0.014	0.007	0.009	0.008	0.009
SR	0.085	0.062	0.047	0.050	0.044	0.044	0.046	0.052	0.052	0.060

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	- 0.032	- 0.036	- 0.046	- 0.028	- 0.028	- 0.017	- 0.032	- 0.026	+ 0.003	- 0.042	- 0.028	0.014	6.60
2	+ 0.030	+ 0.018	+ 0.000	- 0.011	+ 0.004	- 0.000	- 0.005	+ 0.012	- 0.009	+ 0.006	+ 0.005	0.013	1.14
3	+ 0.123	+ 0.109	+ 0.079	+ 0.062	+ 0.017	+ 0.053	+ 0.048	+ 0.044	+ 0.028	+ 0.073	+ 0.064	0.033	6.00
4	- 0.092	+ 0.016	+ 0.028	+ 0.013	- 0.049	+ 0.006	+ 0.068	+ 0.006	+ 0.041	+ 0.028	+ 0.006	0.046	0.45
5	- 0.075	- 0.031	- 0.039	- 0.061	- 0.032	- 0.004	- 0.002	- 0.007	- 0.003	+ 0.013	- 0.024	0.028	2.67
6	- 0.012	- 0.015	- 0.054	- 0.056	- 0.049	- 0.048	- 0.050	- 0.041	- 0.062	- 0.061	- 0.045	0.018	8.01
7	+ 0.046	+ 0.006	+ 0.008	+ 0.007	+ 0.015	+ 0.017	+ 0.022	+ 0.029	+ 0.013	+ 0.022	+ 0.019	0.012	4.79
8	+ 0.109	+ 0.025	+ 0.022	+ 0.036	+ 0.020	- 0.010	+ 0.033	- 0.031	+ 0.010	+ 0.005	+ 0.022	0.037	1.89
9	+ 0.035	+ 0.023	+ 0.021	- 0.001	+ 0.015	+ 0.023	- 0.004	+ 0.011	- 0.008	+ 0.005	+ 0.012	0.014	2.73
10	+ 0.038	+ 0.024	+ 0.026	+ 0.076	+ 0.080	+ 0.081	+ 0.037	+ 0.068	+ 0.051	+ 0.085	+ 0.056	0.024	7.42
11	- 0.184	- 0.152	- 0.013	- 0.012	+ 0.001	- 0.059	- 0.138	- 0.102	- 0.127	- 0.134	- 0.092	0.066	4.39
12	+ 0.027	+ 0.032	+ 0.047	+ 0.058	+ 0.071	+ 0.036	+ 0.063	+ 0.080	+ 0.050	+ 0.042	+ 0.050	0.017	9.22
13	- 0.067	- 0.063	- 0.086	- 0.083	- 0.057	- 0.064	- 0.089	- 0.064	- 0.046	- 0.081	- 0.070	0.014	15.89
d	- 0.004	- 0.003	- 0.001	+ 0.000	+ 0.001	+ 0.001	- 0.004	- 0.001	- 0.005	- 0.003	- 0.002	0.054	
Sd	0.085	0.061	0.046	0.049	0.043	0.043	0.061	0.052	0.050	0.062	0.056		

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 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	1	2	3	4	5	6	7	8	9	10
1	-0.38	-0.59	-1.01	-0.56	-0.64	-0.41	-0.53	-0.50	+0.05	-0.68
2	+0.35	+0.30	+0.01	-0.22	+0.09	-0.01	-0.08	+0.24	-0.18	+0.09
3	+1.45	+1.79	+1.72	+1.26	+0.40	+1.23	+0.79	+0.85	+0.56	+1.19
4	-1.09	+0.26	+0.62	+0.26	-1.14	+0.14	+1.12	+0.13	+0.83	+0.45
5	-0.88	-0.50	-0.86	-1.23	-0.74	-0.09	-0.03	-0.13	-0.07	+0.21
6	-0.14	-0.24	-1.19	-1.13	-1.13	-1.14	-0.83	-0.80	-1.24	-0.99
7	+0.55	+0.10	+0.18	+0.14	+0.34	+0.39	+0.36	+0.56	+0.26	+0.36
8	+1.28	+0.42	+0.48	+0.73	+0.47	-0.23	+0.55	-0.59	+0.19	+0.08
9	+0.42	+0.38	+0.47	-0.03	+0.35	+0.54	-0.06	+0.21	-0.16	+0.08
10	+0.45	+0.39	+0.56	+1.54	+1.85	+1.90	+0.61	+1.32	+1.03	+1.37
11	-2.16	-2.49	-0.29	-0.24	+0.02	-1.39	-2.28	-1.98	-2.55	-2.17
12	+0.32	+0.52	+1.04	+1.17	+1.64	+0.83	+1.04	+1.55	+1.00	+0.68
13	-0.79	-1.04	-1.88	-1.68	-1.32	-1.50	-1.46	-1.24	-0.93	-1.31

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

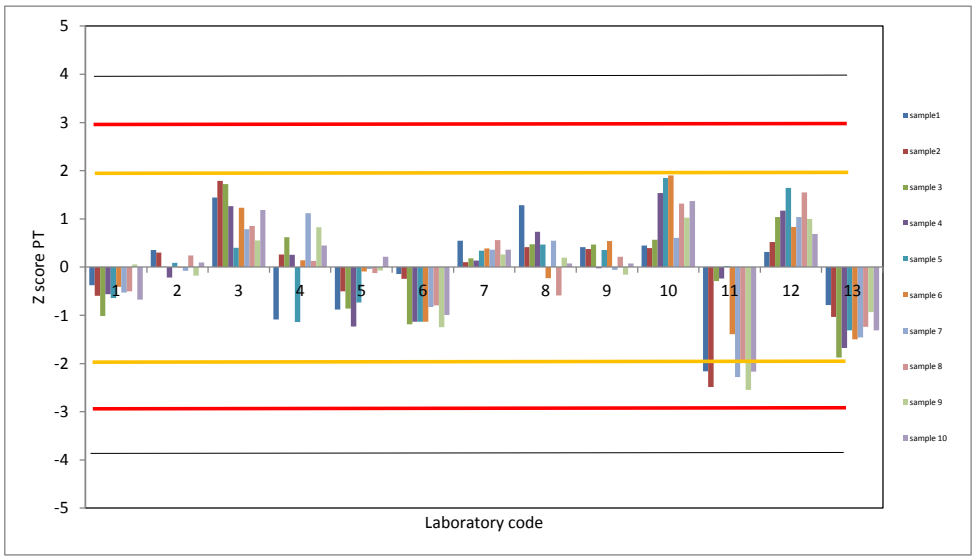


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

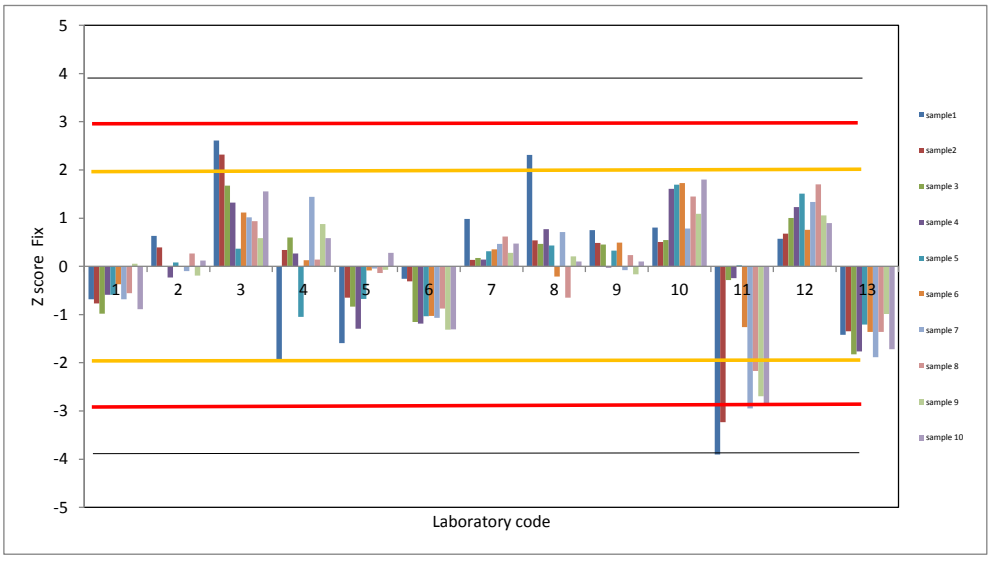
Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-0.68	-0.77	-0.98	-0.59	-0.59	-0.37	-0.68	-0.55	+0.06	-0.89
2	+0.63	+0.39	+0.01	-0.23	+0.08	-0.01	-0.10	+0.27	-0.19	+0.12
3	+2.61	+2.32	+1.68	+1.32	+0.37	+1.12	+1.02	+0.94	+0.59	+1.56
4	-1.96	+0.34	+0.60	+0.27	-1.05	+0.13	+1.44	+0.14	+0.88	+0.59
5	-1.59	-0.65	-0.83	-1.29	-0.68	-0.08	-0.05	-0.14	-0.07	+0.28
6	-0.26	-0.31	-1.15	-1.19	-1.04	-1.03	-1.07	-0.87	-1.32	-1.30
7	+0.99	+0.14	+0.18	+0.14	+0.31	+0.35	+0.47	+0.62	+0.28	+0.47
8	+2.32	+0.54	+0.46	+0.77	+0.43	-0.21	+0.71	-0.65	+0.20	+0.10
9	+0.75	+0.49	+0.45	-0.03	+0.32	+0.49	-0.08	+0.23	-0.17	+0.10
10	+0.80	+0.51	+0.55	+1.61	+1.70	+1.72	+0.78	+1.45	+1.09	+1.80
11	-3.91	-3.23	-0.28	-0.25	+0.02	-1.26	-2.95	-2.17	-2.69	-2.85
12	+0.57	+0.68	+1.01	+1.23	+1.51	+0.76	+1.34	+1.70	+1.06	+0.90
13	-1.42	-1.34	-1.82	-1.76	-1.21	-1.36	-1.89	-1.36	-0.99	-1.72

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



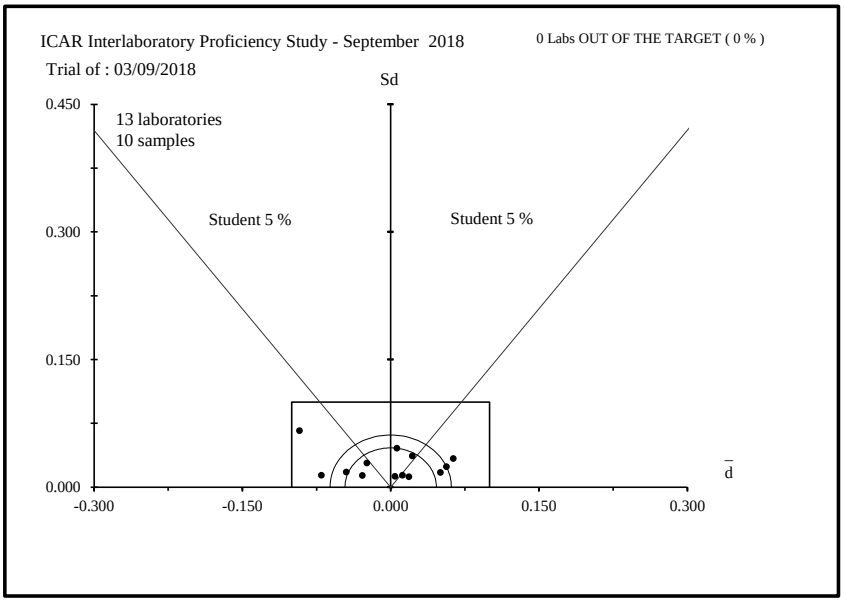


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
LACTOSE CONTENT
Sptember 2018

Name	City	Country
Agroscope Institute for food Sciences IFS	Bern-Liebefeld	Switzerland
Department Valorisation des productions Agricoles	Gembloux	Belgium
Eastern Lab services	Medina	USA
Japan Dairy Technical Association	Tokyo	Japan
Lab Agroalimentario de Santander	Santander Ca	Spain
Laboratorio Standard Latte	Maccarese (Rc	Italy
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Pruszkow	Poland
Milchprüfring Baden-Württemberg e.V.	Kirchheim unt	Germany
Pieno Tyrimai	Kaunas	Lithuania
Qlip B.V.,	Zutphen	NL
Teagasc Food research Center	Cork	IR
Univ. of Ljubljana Biotechnical faculty dept. of Animal Sc. Inst. of Dairy Science and Probiotics	Domzale	Slovenia
Valacta - Centre d'Expertise en Production Laitière du Québec	Quebec	Canada

ICAR

PROFICIENCY TESTING SCHEME

September 2018

Raw Milk

Determination of UREA CONTENT

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

Table1 : **Ranking of the laboratories** Units : mg / 100 g

Nb	%	N°	ig d	Sd	D	**Method**
1	9	1	+ 0.00	0.39	0.39	ISO 14637 IDF 195
2	18	6	+ 0.25	0.51	0.57	ISO 14637 IDF 195
3	27	11	+ 0.25	0.51	0.57	ISO 14637 IDF 195
4	36	3	+ 0.35	0.46	0.58	ISO 14637 IDF 195
5	45	10	+ 0.23	0.55	0.60	ISO 14637 IDF 195
6	55	2	- 0.27	0.54	0.60	ISO 14637 IDF 195
7	64	4	- 0.66	0.63	0.91	ISO 14637 IDF 195
8	73	7	- 0.68	0.67	0.95	ISO 14637 IDF 195
9	82	8	+ 1.05	0.51	1.17	continuous flow analysis
10	91	9	+ 3.20	0.78	3.30	ISO 14637 IDF 195
11	100	5	+ 0.45	5.53	5.55	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 :

$\pm$ 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 10 laboratories using reference method (ISO 14637|IDF 195), 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}	0.49
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	1.29

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	0.21	0.21	0.43	0.22	0.22	0.22	0.22	0.43	0.22	0.43	0.21	20
2	0.60	0.50	0.40	1.10	0.40	0.10	0.40	1.40	0.20	0.90	0.51	20
3	0.40	0.10	0.20	0.40	0.10	0.30	0.10	0.10	0.20	0.20	0.17	20
4	0.10	0.60	1.70	0.20	0.50	0.10	0.40	0.90	0.30	0.30	0.49	20
5	1.50 *	1.80	4.00 *	2.00	0.10	3.70 *	2.90 *	2.20	1.40	1.20	1.67	20
6	0.10	0.20	0.20	0.80	0.20	0.60	0.50	0.00	1.40	0.70	0.44	20
7	0.60	1.40	0.90	0.80	1.20 *	1.40	0.90	1.30	1.40	1.40	0.82	20
8	0.14	0.23	0.20	0.23	0.16	0.77	0.22	0.21	0.15	0.19	0.22	20
9	0.20	0.90	1.00	0.60	0.20	1.23	1.50	0.33	0.20	0.00	0.56	20
10	0.40	0.20	0.20	0.50	0.60	0.90	0.60	1.00	0.00	0.60	0.41	20
11	0.10	0.20	0.20	0.80	0.20	0.60	0.50	0.00	1.40	0.70	0.44	20
Sr	0.39	0.56	0.98	0.60	0.33	0.94	0.76	0.70	0.61	0.52		220
NE	22	22	22	22	22	22	22	22	22	22		
L	0.84	1.98	1.78	2.14	0.77	1.86	1.62	2.46	2.15	1.83		

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	20.53	39.02	48.16	33.86	29.35	43.54	24.19	52.46	57.51	61.28
2	20.00	38.35	47.40	33.65	29.50	42.75	24.50	52.80	56.50	61.75
3	19.70	39.35	49.50	34.20	29.75	43.65	24.35	52.55	58.20	62.10
4	19.05	37.80	47.55	33.90	29.95	42.25	24.00	52.15	55.85	60.75
5	20.15	39.00	45.50	35.10	28.35 *	46.05	24.15	66.80 *	53.30	56.00
6	19.85	38.70	49.10	34.30	29.60	44.00	24.25	51.60	57.90	63.05
7	20.20	38.60	47.15	33.70	29.10	42.30	24.15	51.55	55.90	60.40
8	20.73	40.10	50.19	34.98	29.68	44.54	25.13	53.22	58.18	63.60
9	22.40 *	42.05 *	51.02	36.70 *	32.30 *	46.64	26.77 *	56.02 *	61.51	66.50
10	19.10	38.40	48.70	33.75	29.60	44.05	25.20	53.10	57.80	62.50
11	19.85	38.70	49.10	34.30	29.60	44.00	24.25	51.60	57.90	63.05
M	19.92	38.80	48.49	34.17	29.57	43.98	24.42	52.34	57.32	61.91
REF.	19.83	38.68	48.33	34.03	29.56	43.88	24.27	52.23	57.20	61.86
SD	0.54	0.63	1.55	0.52	0.24	1.39	0.42	0.65	2.03	2.57

M = mean per sample REF. = reference values

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

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

of 10 laboratories using the reference method ISO 14637 | IDF 195, after outliers discarging using Grubbs test 5% risk level

Table IV : Outliers identification

Sample	1	2	3	4	5	6	7	8	9	10
Outliers Cochran	5		5		7	5	5			
Outliers Grubbs	9	9		9	5; 9		9	5; 9		
Sr	0.25	0.55	0.51	0.62	0.24	0.54	0.34	0.56	0.61	0.52
SR	0.60	0.74	1.31	0.68	0.25	1.33	0.49	0.76	2.07	2.59

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	+ 0.71	+ 0.34	- 0.17	- 0.16	- 0.21	- 0.34	- 0.08	+ 0.23	+ 0.32	- 0.58	+ 0.00	0.39	0.04
2	+ 0.17	- 0.33	- 0.93	- 0.38	- 0.06	- 1.13	+ 0.23	+ 0.57	- 0.70	- 0.11	- 0.27	0.54	1.56
3	- 0.13	+ 0.67	+ 1.17	+ 0.17	+ 0.19	- 0.23	+ 0.08	+ 0.32	+ 1.00	+ 0.24	+ 0.35	0.46	2.40
4	- 0.78	- 0.88	- 0.78	- 0.13	+ 0.39	- 1.63	- 0.27	- 0.08	- 1.35	- 1.11	- 0.66	0.63	3.32
5	+ 0.32	+ 0.32	- 2.83	+ 1.07	- 1.21	+ 2.17	- 0.12	+ 14.57	- 3.90	- 5.86	+ 0.45	5.53	0.26
6	+ 0.02	+ 0.02	+ 0.77	+ 0.27	+ 0.04	+ 0.12	- 0.02	- 0.63	+ 0.70	+ 1.19	+ 0.25	0.51	1.54
7	+ 0.37	- 0.08	- 1.18	- 0.33	- 0.46	- 1.58	- 0.12	- 0.68	- 1.30	- 1.46	- 0.68	0.67	3.22
8	+ 0.91	+ 1.43	+ 1.85	+ 0.95	+ 0.12	+ 0.66	+ 0.86	+ 0.99	+ 0.98	+ 1.74	+ 1.05	0.51	6.48
9	+ 2.57	+ 3.37	+ 2.69	+ 2.67	+ 2.74	+ 2.76	+ 2.50	+ 3.79	+ 4.31	+ 4.64	+ 3.20	0.78	12.93
10	- 0.73	- 0.28	+ 0.37	- 0.28	+ 0.04	+ 0.17	+ 0.93	+ 0.87	+ 0.60	+ 0.64	+ 0.23	0.55	1.35
11	+ 0.02	+ 0.02	+ 0.77	+ 0.27	+ 0.04	+ 0.12	- 0.02	- 0.63	+ 0.70	+ 1.19	+ 0.25	0.51	1.54
d	+ 0.09	+ 0.12	+ 0.16	+ 0.15	+ 0.01	+ 0.10	+ 0.15	+ 0.11	+ 0.13	+ 0.05	+ 0.38	1.96	
Sd	0.54	0.63	1.55	0.52	0.24	1.39	0.42	0.65	2.03	2.57	1.29		

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	+1.30	+0.55	-0.11	-0.32	-0.89	-0.25	-0.19	+0.36	+0.16	-0.23
2	+0.32	-0.52	-0.60	-0.73	-0.26	-0.81	+0.56	+0.88	-0.34	-0.04
3	-0.23	+1.08	+0.75	+0.33	+0.78	-0.16	+0.20	+0.50	+0.50	+0.09
4	-1.43	-1.40	-0.51	-0.25	+1.60	-1.17	-0.64	-0.12	-0.66	-0.43
5	+0.60	+0.52	-1.83	+2.08	-5.02	+1.56	-0.28	+22.44	-1.92	-2.28
6	+0.04	+0.04	+0.50	+0.53	+0.16	+0.09	-0.04	-0.96	+0.35	+0.46
7	+0.69	-0.12	-0.76	-0.64	-1.91	-1.14	-0.28	-1.04	-0.64	-0.57
8	+1.67	+2.28	+1.20	+1.85	+0.49	+0.48	+2.07	+1.53	+0.49	+0.68
9	+4.73	+5.39	+1.73	+5.19	+11.33	+1.98	+6.02	+5.83	+2.13	+1.81
10	-1.33	-0.44	+0.24	-0.54	+0.16	+0.12	+2.24	+1.35	+0.30	+0.25
11	+0.04	+0.04	+0.50	+0.53	+0.16	+0.09	-0.04	-0.96	+0.35	+0.46

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

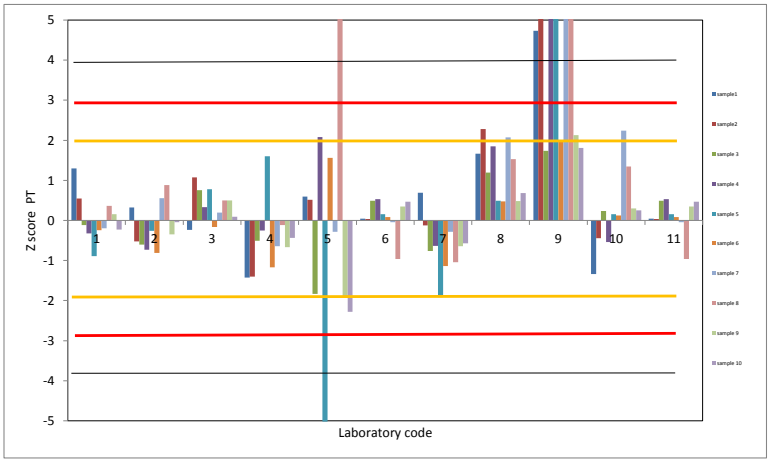


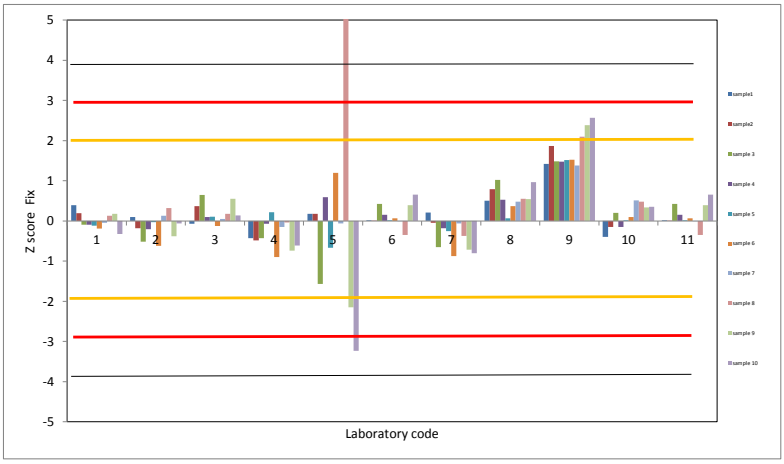
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample/Lab code	1	2	3	4	5	6	7	8	9	10
1	+0.39	+0.19	-0.10	-0.09	-0.12	-0.19	-0.04	+0.13	+0.18	-0.32
2	+0.10	-0.18	-0.52	-0.21	-0.03	-0.62	+0.13	+0.32	-0.38	-0.06
3	-0.07	+0.37	+0.65	+0.10	+0.10	-0.13	+0.05	+0.18	+0.56	+0.13
4	-0.43	-0.48	-0.43	-0.07	+0.21	-0.90	-0.15	-0.04	-0.74	-0.61
5	+0.18	+0.18	-1.56	+0.59	-0.67	+1.20	-0.07	+8.05	-2.15	-3.24
6	+0.01	+0.01	+0.42	+0.15	+0.02	+0.07	-0.01	-0.35	+0.39	+0.66
7	+0.21	-0.04	-0.65	-0.18	-0.26	-0.87	-0.07	-0.37	-0.72	-0.81
8	+0.50	+0.79	+1.02	+0.53	+0.07	+0.36	+0.48	+0.55	+0.54	+0.96
9	+1.42	+1.86	+1.48	+1.48	+1.51	+1.52	+1.38	+2.09	+2.38	+2.56
10	-0.40	-0.15	+0.20	-0.15	+0.02	+0.09	+0.51	+0.48	+0.33	+0.35
11	+0.01	+0.01	+0.42	+0.15	+0.02	+0.07	-0.01	-0.35	+0.39	+0.66

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



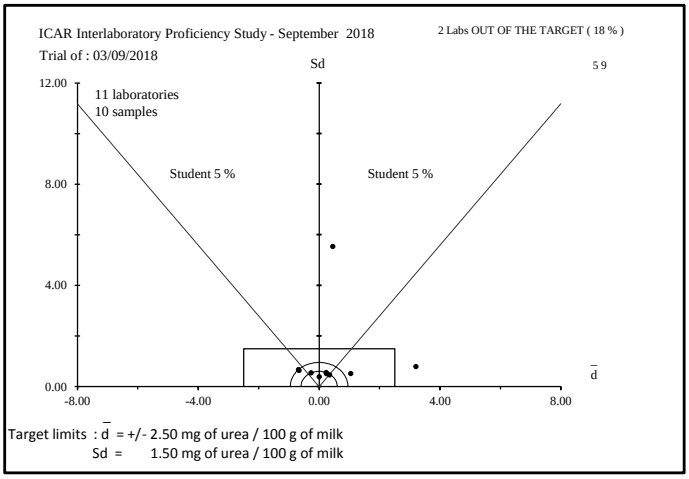


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
UREA CONTENT
September 2018

Agroscope Institute for food Sciences IFS	Bern-Liebefeld	Switzerland
Central Milk Lab ICBA	Caesarea	Israel
Department Valorisation des productions Agricoles	Gembloux	Belgium
Eastern Lab services	Medina	USA
Laboratorio Standard Latte	Maccarese (R	Italy
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Pruszkow	Poland
Milchprüfring Baden-Württemberg e.V.	Kirchheim un	Germany
Pieno Tyrimai	Kaunas	Lithuania
Qlip B.V.,	Zutphen	NL
Univ. of Ljubljana Biotechnical faculty dept. of Animal Sc. Inst. of Dairy Science and Probiotics	Domzale	Slovenia

ICAR
PROFICIENCY TESTING SCHEME

September 2018

Raw Milk

Enumeration of SOMATIC CELLS

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

Proficiency test accreditated ISO 17043

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

Nb	%	N°	Sign	d	Sd	D	Method
1	3	27	+	0%	2%	2%	B
2	6	1	-	2%	2%	2%	A
3	9	30	-	2%	2%	2%	A
4	12	28	-	1%	3%	3%	A
5	15	17	-	5%	5%	7%	B
6	18	33	-	7%	5%	9%	B
7	21	34	-	7%	6%	9%	B
8	24	4	-	7%	6%	9%	B
9	26	10	-	7%	6%	9%	B
10	29	7	-	7%	7%	10%	B
11	32	12	-	9%	7%	11%	B
12	35	24	-	9%	8%	12%	B
13	38	23	-	9%	8%	12%	B
14	41	29	-	9%	8%	12%	B
15	44	20	-	9%	10%	13%	B
16	47	21	-	10%	9%	13%	B
17	50	3	-	12%	10%	16%	B
18	53	6	+	13%	10%	17%	A
19	56	26	-	13%	11%	17%	B
20	59	11	-	9%	15%	17%	B
21	62	16	-	15%	13%	20%	B
22	65	5	+	16%	13%	20%	B
23	68	19	+	7%	20%	21%	B
24	71	18	+	14%	17%	22%	B
25	74	15	-	18%	15%	23%	B
26	76	2	-	19%	14%	24%	B
27	79	14	+	21%	17%	27%	B
28	82	22	+	21%	17%	27%	B
29	85	32	+	21%	17%	27%	B
30	88	8	+	24%	19%	30%	B
31	91	31	+	24%	19%	30%	B
32	94	9	+	26%	20%	33%	A
33	97	13	+	24%	23%	33%	B
34	100	25	-	34%	22%	41%	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 34 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

(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}	13	3%
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	100	20%

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	10	5	0	0	5	5	0	10	20	10	6	20
2	5	2	16	20	5	16	1	13	2	22	9	20
3	1	3	4	4	1	3	3	4	1	26	6	20
4	6	7	4	5	6	9	2	22	29	23	10	20
5	7	8	12	15	43 *	45	17	2	24	14	16	20
6	8	9	20	47 *	28	38	25	27	4	17	18	20
7	4	15	5	9	9	2	41	8	29	23	13	20
8	2	0	0	6	3	10	2	1	19	0	5	20
9	3	3	7	5	7	5	3	8	15	46	11	20
10	7	14	1	3	21	1	3	51	20	0	14	20
11	8	12	4	28	5	6	7	23	10	12	10	20
12	8	0	1	2	7	13	17	26	28	22	11	20
13	4	1	13	8	1	10	3	45	7	14	11	20
14	1	3	11	13	9	16	4	4	27	44	13	20
15	3	4	15	26	30	62	58 *	80 *	33	81	34	20
16	3	2	4	5	1	6	5	13	8	28	8	20
17	2	1	4	12	1	9	3	6	3	8	4	20
18	5	10	3	17	7	43	41	33	4	11	16	20
19	6	21	13	2	7	70	573 *	13	64	28	130	20
20	7	2	7	12	16	37	5	40	22	4	14	20
21	2	1	29	12	11	14	16	4	4	2	9	20
22	0	24	2	3	11	28	18	2	6	6	10	20
23	3	3	11	0	4	28	19	8	2	25	10	20
24	5	4	1	14	6	20	1	6	49	26	14	20
25	6	6	6	4	3	7	27	12	14	6	8	20
26	0	14	13	1	3	18	19	7	55	3	14	20
27	1	3	15	25	21	4	8	25	53	70	22	20
28	2	3	6	0	2	3	13	16	37	27	11	20
29	4	5	0	4	8	9	11	17	13	59	15	20
30	10	5	0	0	5	5	0	10	20	10	6	20
31	2	0	0	6	3	10	2	1	19	0	5	20
32	0	24	2	3	11	28	18	2	6	6	10	20
33	1	11	14	38	25	56	126 *	144 *	117 *	182 *	67	20
34	6	4	11	5	4	21	4	26	44	39	15	20
Sr	4	7	7	11	10	19	72	24	23	30		680
r	25	25	42	42	50	63	63	126	126	126		
NE	68	68	68	68	68	68	68	68	68	68		
L	15	28	30	39	35	80	46	60	81	88		

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

NL : number of measurements per laboratory

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

SE : repeatability standard deviation per sample

NE : number of measurements per sample

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

** : missing data

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

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

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	35	73	150	220	358	453	620	865	1000	1205
2	28	61	134	182	283	375	497	705	819	1017
3	43	72	148	205	307	409	568	722	935	1067
4	47	77	150	204	320	437	581	804	954	1130
5	50	88	198	266	389	544	712	991	1197	1412
6	53	92	192	301	451	521	743	997	1015	1344
7	42	75	151	209	331	438	585	818	935	1113
8	52	104	205	292	432	584	771	1069	1266	1498
9	58	107	207	308	435	595	799	1078	1290	1505
10	37	75	150	213	327	433	594	804	954	1121
11	36	150 *	70	310	210	422	571	793	942	1086
12	37	70	148	219	313	439	562	786	948	1106
13	47	95	187	279	415	568	782	1067	1308	1541
14	61	103	187	282	442	550	750	1053	1225	1470
15	31	62	130	187	292	404	526	694	857	988
16	42	71	142	204	301	398	518	732	863	1026
17	43	74	151	213	342	458	589	805	979	1138
18	21	65	156	246	394	528	696	1045	1198	1417
19	35	93	175	263	395	501	414	996	1167	1359
20	52	87	155	228	323	416	570	760	910	1106
21	42	73	149	219	308	421	564	769	926	1087
22	48	104	189	287	429	570	762	1027	1227	1482
23	41	77	148	213	314	438	573	786	927	1089
24	39	69	151	219	316	432	578	790	926	1092
25	18	41	81	127	194	287	415	578	757	843
26	37	72	147	206	302	413	551	735	898	1062
27	46	75	156	224	341	465	627	877	1051	1222
28	48	74	149	231	333	475	645	841	1009	1215
29	37	77	138	202	328	440	563	805	923	1086
30	35	73	150	220	358	453	620	865	1000	1205
31	52	104	205	292	432	584	771	1069	1266	1498
32	48	104	189	287	429	570	762	1027	1227	1482
33	40	71	140	214	326	443	580	806	953	1132
34	39	79	160	215	315	449	581	788	976	1124
M	42	80	157	235	346	468	619	863	1024	1214
REF.	42	80	159	236	349	469	621	865	1023	1215
SD	9	15	30	42	63	71	102	135	151	186

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 34 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 : Outliers identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran				6	5		15; 19 33	15; 33	33	33
Outliers Grubbs		11								
Sr	4	7	7	9	8	19	11	14	19	21
SR	10	16	31	42	64	72	98	136	154	189
Sr %	9%	8%	5%	4%	2%	4%	2%	2%	2%	2%
SR %	23%	20%	20%	18%	18%	15%	16%	16%	15%	16%

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	d	Sd_{lab}	t
1	- 17%	- 9%	- 5%	- 7%	+ 2%	- 4%	- 0%	+ 0%	- 2%	- 1%	- 2%	2%	2.78
2	- 34%	- 24%	- 16%	- 23%	- 19%	- 20%	- 20%	- 19%	- 20%	- 16%	- 19%	14%	4.18
3	+ 1%	- 11%	- 7%	- 13%	- 12%	- 13%	- 9%	- 17%	- 9%	- 12%	- 12%	10%	3.48
4	+ 12%	- 4%	- 5%	- 14%	- 8%	- 7%	- 6%	- 7%	- 7%	- 7%	- 7%	6%	3.84
5	+ 18%	+ 10%	+ 25%	+ 13%	+ 11%	+ 16%	+ 15%	+ 15%	+ 17%	+ 16%	+ 16%	13%	3.68
6	+ 26%	+ 14%	+ 21%	+ 28%	+ 29%	+ 11%	+ 20%	+ 15%	- 1%	+ 11%	+ 13%	10%	3.86
7	+ 0%	- 7%	- 5%	- 11%	- 5%	- 7%	- 6%	- 5%	- 9%	- 8%	- 7%	7%	3.34
8	+ 24%	+ 30%	+ 29%	+ 24%	+ 24%	+ 24%	+ 24%	+ 24%	+ 24%	+ 23%	+ 24%	19%	4.03
9	+ 37%	+ 33%	+ 30%	+ 31%	+ 24%	+ 27%	+ 29%	+ 25%	+ 26%	+ 24%	+ 26%	20%	4.19
10	- 13%	- 6%	- 6%	- 10%	- 6%	- 8%	- 4%	- 7%	- 7%	- 8%	- 7%	6%	3.72
11	- 14%	+ 88%	- 56%	+ 32%	- 40%	- 10%	- 8%	- 8%	- 8%	- 11%	- 9%	15%	2.01
12	- 12%	- 12%	- 7%	- 7%	- 10%	- 7%	- 10%	- 9%	- 7%	- 9%	- 9%	7%	3.84
13	+ 12%	+ 18%	+ 18%	+ 18%	+ 19%	+ 21%	+ 26%	+ 23%	+ 28%	+ 27%	+ 24%	23%	3.36
14	+ 44%	+ 28%	+ 18%	+ 20%	+ 26%	+ 17%	+ 21%	+ 22%	+ 20%	+ 21%	+ 21%	17%	3.99
15	- 27%	- 22%	- 18%	- 21%	- 16%	- 14%	- 15%	- 20%	- 16%	- 19%	- 18%	15%	3.78
16	- 1%	- 11%	- 11%	- 14%	- 14%	- 15%	- 17%	- 15%	- 16%	- 16%	- 15%	13%	3.61
17	+ 3%	- 8%	- 5%	- 10%	- 2%	- 3%	- 5%	- 7%	- 4%	- 6%	- 5%	5%	3.26
18	- 51%	- 19%	- 2%	+ 4%	+ 13%	+ 12%	+ 12%	+ 21%	+ 17%	+ 17%	+ 14%	17%	2.61
19	- 17%	+ 16%	+ 10%	+ 12%	+ 13%	+ 7%	- 33%	+ 15%	+ 14%	+ 12%	+ 7%	20%	1.04
20	+ 23%	+ 9%	- 3%	- 3%	- 7%	- 11%	- 8%	- 12%	- 11%	- 9%	- 9%	10%	2.93
21	+ 0%	- 9%	- 6%	- 7%	- 12%	- 10%	- 9%	- 11%	- 9%	- 11%	- 10%	9%	3.59
22	+ 14%	+ 30%	+ 19%	+ 22%	+ 23%	+ 21%	+ 23%	+ 19%	+ 20%	+ 22%	+ 21%	17%	3.93
23	- 3%	- 4%	- 7%	- 10%	- 10%	- 7%	- 8%	- 9%	- 9%	- 10%	- 9%	8%	3.41
24	- 8%	- 14%	- 5%	- 7%	- 9%	- 8%	- 7%	- 9%	- 10%	- 10%	- 9%	8%	3.47
25	- 57%	- 49%	- 49%	- 46%	- 45%	- 39%	- 33%	- 33%	- 26%	- 31%	- 34%	22%	4.78
26	- 12%	- 10%	- 8%	- 13%	- 14%	- 12%	- 11%	- 15%	- 12%	- 13%	- 13%	11%	3.68
27	+ 9%	- 7%	- 2%	- 5%	- 2%	- 1%	+ 1%	+ 1%	+ 3%	+ 1%	+ 0%	2%	0.61
28	+ 14%	- 8%	- 6%	- 2%	- 5%	+ 1%	+ 4%	- 3%	- 1%	- 0%	- 1%	3%	0.94
29	- 12%	- 4%	- 13%	- 14%	- 6%	- 6%	- 9%	- 7%	- 10%	- 11%	- 9%	8%	3.52
30	- 17%	- 9%	- 5%	- 7%	+ 2%	- 4%	- 0%	+ 0%	- 2%	- 1%	- 2%	2%	2.78
31	+ 24%	+ 30%	+ 29%	+ 24%	+ 24%	+ 24%	+ 24%	+ 24%	+ 24%	+ 23%	+ 24%	19%	4.03
32	+ 14%	+ 30%	+ 19%	+ 22%	+ 23%	+ 21%	+ 23%	+ 19%	+ 20%	+ 22%	+ 21%	17%	3.93
33	- 6%	- 12%	- 12%	- 9%	- 7%	- 6%	- 7%	- 7%	- 7%	- 7%	- 7%	5%	4.17
34	- 7%	- 1%	+ 1%	- 9%	- 10%	- 4%	- 6%	- 9%	- 5%	- 8%	- 7%	6%	3.35
d	- 1%	- 0%	- 1%	- 0%	- 1%	- 0%	- 0%	- 0%	+ 0%	- 0%	- 0%	18%	
Sd	22%	19%	19%	18%	18%	15%	16%	16%	15%	15%			

d = mean of differences Sd_{lab} = 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	1	2	3	4	5	6	7	8	9	10
1	-0.74	-0.49	-0.29	-0.37	+0.13	-0.24	-0.01	+0.00	-0.15	-0.05
2	-1.54	-1.24	-0.81	-1.27	-1.06	-1.33	-1.22	-1.19	-1.35	-1.07
3	+0.06	-0.56	-0.35	-0.72	-0.68	-0.86	-0.52	-1.06	-0.59	-0.80
4	+0.54	-0.23	-0.29	-0.76	-0.46	-0.46	-0.39	-0.45	-0.46	-0.46
5	+0.81	+0.53	+1.29	+0.71	+0.63	+1.04	+0.89	+0.93	+1.15	+1.06
6	+1.18	+0.75	+1.10	+1.54	+1.62	+0.73	+1.19	+0.97	-0.05	+0.69
7	+0.01	-0.36	-0.27	-0.64	-0.30	-0.44	-0.35	-0.35	-0.59	-0.55
8	+1.07	+1.57	+1.53	+1.34	+1.31	+1.62	+1.47	+1.51	+1.60	+1.52
9	+1.66	+1.74	+1.57	+1.70	+1.36	+1.76	+1.74	+1.58	+1.76	+1.56
10	-0.58	-0.33	-0.30	-0.54	-0.36	-0.52	-0.27	-0.45	-0.46	-0.51
11	-0.63	+4.59	-2.92	+1.76	-2.22	-0.67	-0.49	-0.54	-0.54	-0.69
12	-0.52	-0.65	-0.37	-0.39	-0.58	-0.43	-0.58	-0.58	-0.50	-0.59
13	+0.54	+0.95	+0.92	+1.03	+1.04	+1.39	+1.58	+1.49	+1.88	+1.76
14	+1.98	+1.48	+0.92	+1.09	+1.47	+1.14	+1.27	+1.39	+1.33	+1.37
15	-1.22	-1.18	-0.96	-1.15	-0.91	-0.92	-0.93	-1.26	-1.10	-1.22
16	-0.05	-0.59	-0.55	-0.76	-0.77	-1.00	-1.01	-0.99	-1.06	-1.02
17	+0.11	-0.42	-0.25	-0.53	-0.12	-0.17	-0.31	-0.44	-0.30	-0.41
18	-2.28	-0.98	-0.11	+0.24	+0.71	+0.82	+0.73	+1.33	+1.16	+1.09
19	-0.74	+0.82	+0.52	+0.65	+0.72	+0.45	-2.03	+0.97	+0.95	+0.78
20	+1.02	+0.46	-0.14	-0.18	-0.42	-0.76	-0.50	-0.78	-0.75	-0.59
21	+0.01	-0.49	-0.34	-0.39	-0.66	-0.68	-0.55	-0.71	-0.64	-0.69
22	+0.65	+1.57	+1.00	+1.21	+1.26	+1.42	+1.38	+1.20	+1.35	+1.44
23	-0.15	-0.23	-0.37	-0.53	-0.56	-0.44	-0.47	-0.58	-0.64	-0.68
24	-0.36	-0.72	-0.27	-0.39	-0.53	-0.52	-0.42	-0.55	-0.65	-0.66
25	-2.55	-2.55	-2.56	-2.57	-2.48	-2.57	-2.02	-2.12	-1.76	-2.00
26	-0.52	-0.52	-0.40	-0.71	-0.76	-0.79	-0.69	-0.96	-0.83	-0.83
27	+0.38	-0.36	-0.11	-0.28	-0.14	-0.06	+0.06	+0.09	+0.18	+0.04
28	+0.65	-0.42	-0.32	-0.11	-0.26	+0.07	+0.23	-0.18	-0.10	-0.00
29	-0.52	-0.23	-0.68	-0.79	-0.34	-0.42	-0.57	-0.45	-0.66	-0.70
30	-0.74	-0.49	-0.29	-0.37	+0.13	-0.24	-0.01	+0.00	-0.15	-0.05
31	+1.07	+1.57	+1.53	+1.34	+1.31	+1.62	+1.47	+1.51	+1.60	+1.52
32	+0.65	+1.57	+1.00	+1.21	+1.26	+1.42	+1.38	+1.20	+1.35	+1.44
33	-0.26	-0.62	-0.62	-0.51	-0.38	-0.37	-0.40	-0.44	-0.47	-0.45
34	-0.31	-0.06	+0.03	-0.50	-0.54	-0.29	-0.39	-0.57	-0.31	-0.49

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

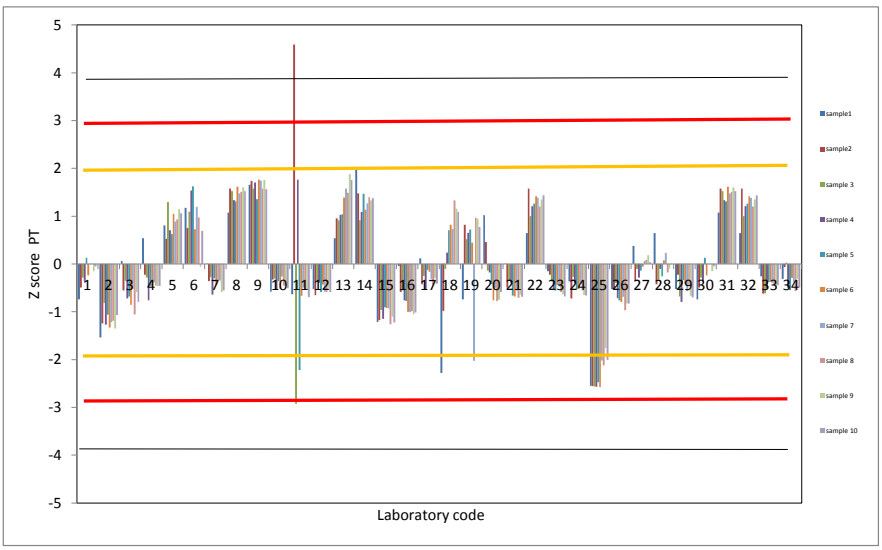


Table VII : **Zscore of the different laboratories for each sample.**

ZS calculated on the standard deviation of reproducibility of the method

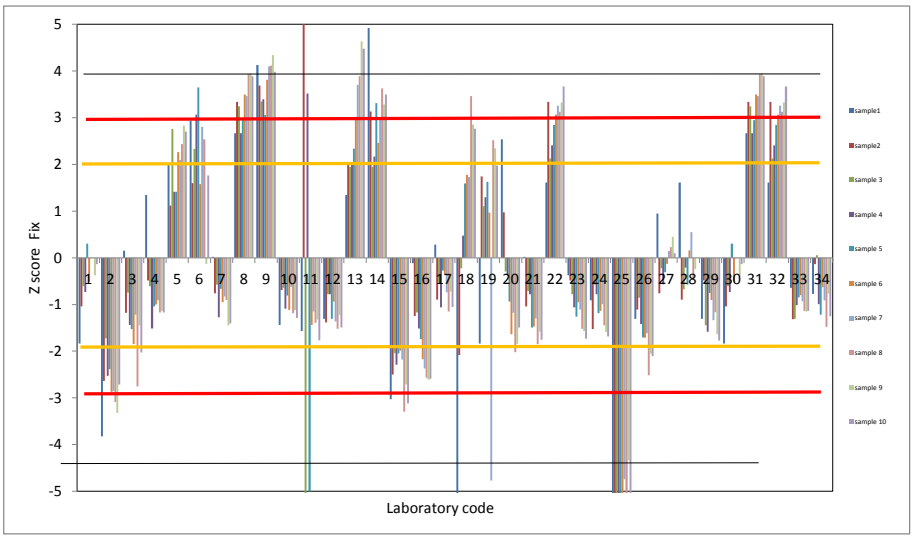
Sample/Lab code	1	2	3	4	5	6	7	8	9	10
1	-1.84	-1.04	-0.61	-0.73	+0.30	-0.51	-0.01	+0.00	-0.38	-0.14
2	-3.82	-2.64	-1.73	-2.53	-2.39	-2.87	-2.86	-3.09	-3.33	-2.72
3	+0.15	-1.18	-0.75	-1.44	-1.53	-1.85	-1.22	-2.75	-1.44	-2.03
4	+1.34	-0.48	-0.61	-1.51	-1.04	-1.00	-0.91	-1.17	-1.13	-1.17
5	+2.01	+1.11	+2.75	+1.41	+1.41	+2.26	+2.09	+2.43	+2.83	+2.70
6	+2.93	+1.60	+2.33	+3.07	+3.65	+1.57	+2.81	+2.54	-0.13	+1.76
7	+0.02	-0.76	-0.57	-1.28	-0.67	-0.95	-0.83	-0.90	-1.44	-1.41
8	+2.67	+3.34	+3.24	+2.66	+2.95	+3.49	+3.46	+3.93	+3.95	+3.88
9	+4.13	+3.68	+3.35	+3.40	+3.06	+3.81	+4.10	+4.11	+4.34	+3.98
10	-1.44	-0.69	-0.64	-1.09	-0.81	-1.12	-0.62	-1.18	-1.13	-1.29
11	-1.57	+9.73	-6.21	+3.51	-5.00	-1.44	-1.15	-1.39	-1.32	-1.77
12	-1.31	-1.39	-0.78	-0.78	-1.31	-0.94	-1.36	-1.52	-1.22	-1.49
13	+1.34	+2.02	+1.95	+2.05	+2.34	+3.01	+3.70	+3.89	+4.63	+4.47
14	+4.92	+3.13	+1.95	+2.17	+3.31	+2.46	+2.98	+3.63	+3.28	+3.50
15	-3.03	-2.50	-2.04	-2.29	-2.05	-1.99	-2.18	-3.29	-2.71	-3.12
16	-0.11	-1.25	-1.17	-1.51	-1.74	-2.17	-2.37	-2.57	-2.61	-2.59
17	+0.28	-0.90	-0.54	-1.06	-0.27	-0.36	-0.74	-1.15	-0.73	-1.06
18	-5.68	-2.08	-0.22	+0.47	+1.59	+1.77	+1.72	+3.46	+2.85	+2.76
19	-1.84	+1.74	+1.11	+1.30	+1.62	+0.97	-4.77	+2.52	+2.34	+1.98
20	+2.54	+0.98	-0.29	-0.36	-0.94	-1.64	-1.18	-2.02	-1.84	-1.49
21	+0.02	-1.04	-0.71	-0.78	-1.49	-1.47	-1.30	-1.85	-1.58	-1.76
22	+1.61	+3.34	+2.12	+2.40	+2.84	+3.07	+3.25	+3.13	+3.32	+3.66
23	-0.38	-0.48	-0.78	-1.06	-1.26	-0.95	-1.11	-1.52	-1.57	-1.73
24	-0.91	-1.53	-0.57	-0.78	-1.19	-1.13	-0.99	-1.44	-1.59	-1.69
25	-6.34	-5.42	-5.44	-5.12	-5.57	-5.56	-4.74	-5.53	-4.34	-5.10
26	-1.31	-1.11	-0.85	-1.42	-1.71	-1.71	-1.61	-2.51	-2.05	-2.11
27	+0.95	-0.76	-0.22	-0.57	-0.31	-0.13	+0.15	+0.23	+0.45	+0.10
28	+1.61	-0.90	-0.68	-0.21	-0.58	+0.16	+0.55	-0.46	-0.24	-0.01
29	-1.31	-0.48	-1.45	-1.58	-0.76	-0.91	-1.34	-1.16	-1.64	-1.78
30	-1.84	-1.04	-0.61	-0.73	+0.30	-0.51	-0.01	+0.00	-0.38	-0.14
31	+2.67	+3.34	+3.24	+2.66	+2.95	+3.49	+3.46	+3.93	+3.95	+3.88
32	+1.61	+3.34	+2.12	+2.40	+2.84	+3.07	+3.25	+3.13	+3.32	+3.66
33	-0.64	-1.32	-1.31	-1.02	-0.85	-0.80	-0.93	-1.13	-1.15	-1.14
34	-0.78	-0.14	+0.06	-0.99	-1.22	-0.63	-0.91	-1.48	-0.77	-1.25

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



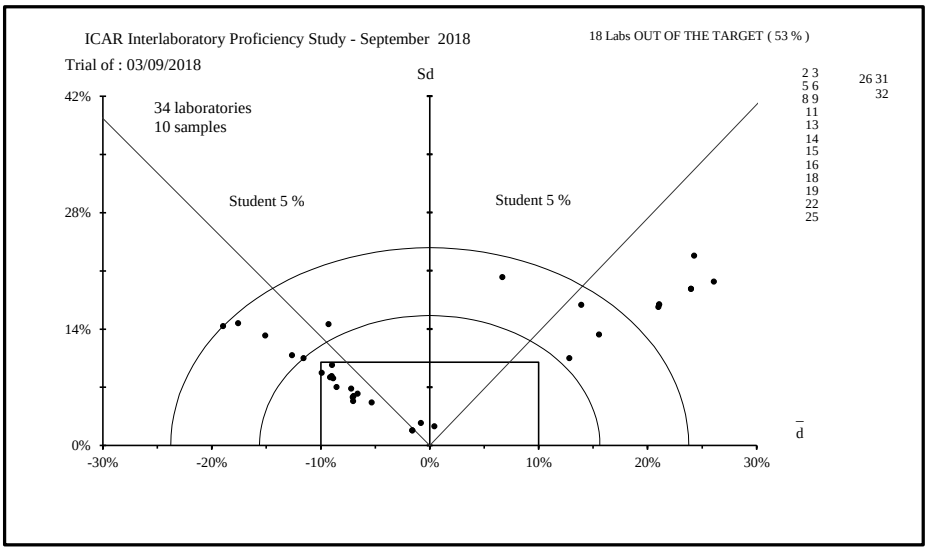


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST

RAW MILK

SOMATIC CELL CONTENT
September 2018

Name	City	Country
Actalia	Poligny	France
Agroscope Institute for food Sciences IFS	Bern-Liebefeld	Switzerland
Alip	Sousada	Portugal
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
Direction de l' Amelioration Genetique DirectiondeAmeliorationGenetique	Sidi Thabet	Tunisie
Eastern Lab services	Medina	USA
Eurofins Steins Laboratory A/B	Jönköping	Sweden
Lab Agroalimentario de Santander	Santander Cantabria	Spain
Laborator pro rozbor mléka Brno, Ceskomoravská spolecnost chovatelú a.s.	Brno	Czech Republic
Laboratorio Standard Latte	Maccarese (Roma)	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
Milchprüfring Baden-Württemberg e.V.	Kirchheim unter Teck	Germany
Osuuskunta Satamaito, laboratorio	Pori	Finland
Pieno Tyrimai	Kaunas	Lithuania
Plemenárske sluzby SR s.p.	Zilina	Slovakia
Qlip B.V.,	Zutphen	NL
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
Univ.of Pretoria Vet Sciences Milk Lab	Pretoria	South Africa
Valio Oy/Seinajoen aluelaboratorio	Seinajoki	Finland