Frame of activity : ICAR Milk Analyses Sub-Committee (MA SC)

ICAR - PROFICIENCY TESTING SCHEME
CHEMICAL "REFERENCE" METHODS

RAW COW MILK

Organisers: ICAR, Via Savoia 78, 00191 Rome, Italy

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ICAR Proficiency Test (PT) Chemical "Reference" methods – March 2016

1. Introduction

Dear Participant,

Thank you for participating in the ICAR Proficiency Test (PT) March 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" ICAR 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 cell is grey if you have not participated for that parameter. The control charts H 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. For example in a result excel file it was requested to report the total nitrogen and not the crude protein.

D) In this table is reported if some of your results are outlier for Grubbs or Cochran test.

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E) The evaluation of repeatability of the results should be one of the first controls before communication of the data. In table E 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.

F) In table F 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.

G) In table G 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. For this round the somatic cell ranking is not considered to evaluate the performance of the lab.

H) The control charts have been created using your data obtained with the Z-Score$_{PT}$ and Z-Score$_{FIX}$. The standard deviation of the method will be the same in the next PT round and it will facilitate the comparison of your performance over the time.

Your Control Charts will be updated with data as the next ICAR PT rounds happen and will be reported in the subsequent ICAR PT reports.

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

<u>In the second part of the report</u> 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.

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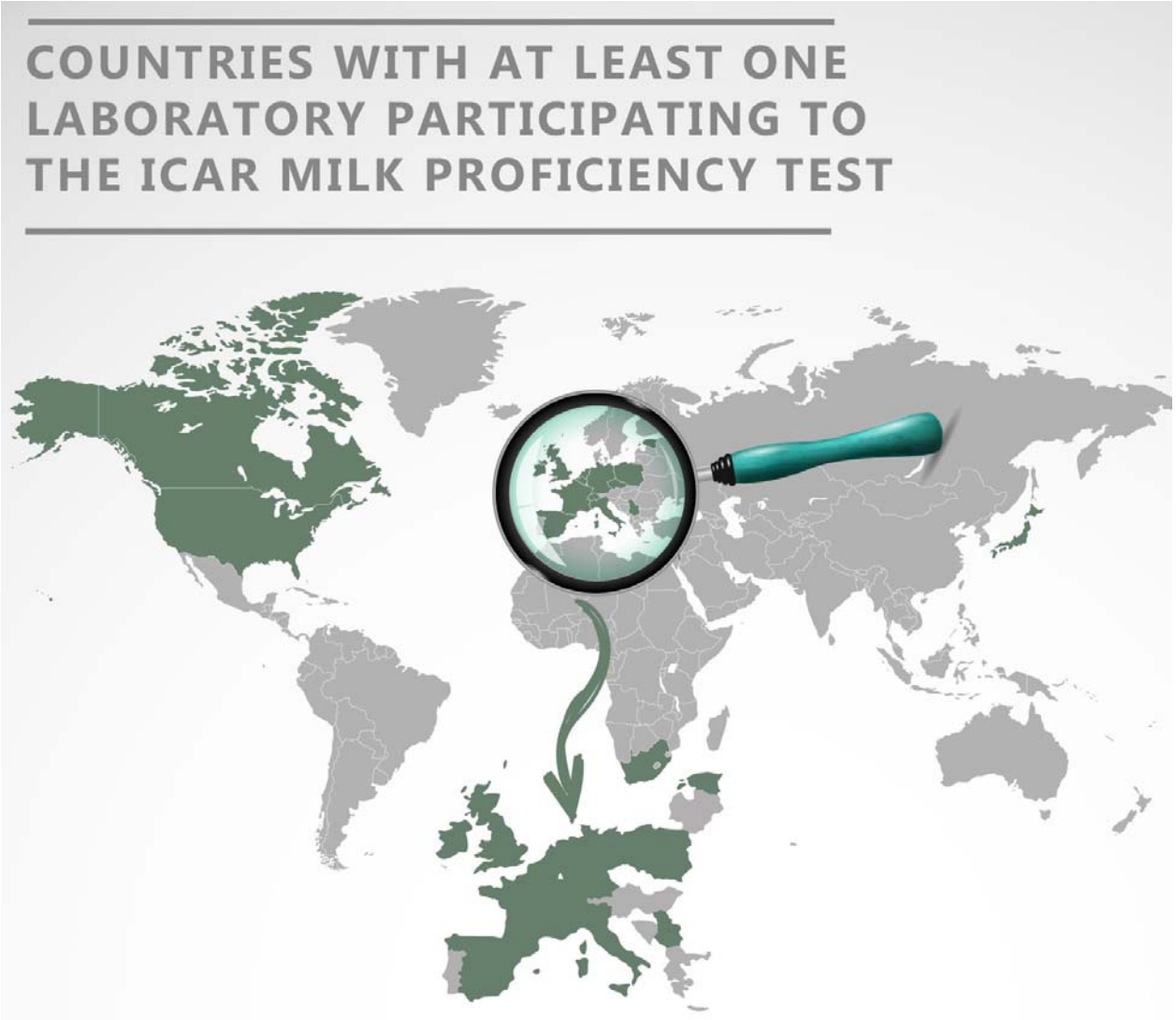
ICAR would like to see, in the next years, the part 4 of this report, completed with the results, reference and/or routine methods, from all the ICAR countries for the parameters indicated.

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 this ICAR PT round with at least one parameter is reported below and upload on ICAR website

http://www.icar.org/index.php/icar-certifications/milk-laboratories-proficiency-test-2016/



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ICAR Member with at least one Milk laboratory participating to the Proficiency Test Round (March 2016)		ICAR Member with no laboratory participating to the Proficiency Test Round (March 2016)	
Département Valorisation des Productions agricoles (DVP), Centre Wallon de Recherche Agronomique – CRA -W	Belgium	INTI – LACTEOS	Argentina
T&V – ILVO Eenheid Technologie en Voeding Productkwaliteit en Voedselveiligheid	Belgium	Milchprüfring Süd	Austria
Valacta – Centre d'Expertise en Production Laitière du Québec	Canada	Shanghai Dairy Cattle Breeding Center Co., Ltd	China
Eesti Pollumajandusloomade Joudluskontrolli AS, Milk Analysing Laboratory	Estonia	University of Zagreb, Faculty of Agriculture, Department of Dairy Science, Reference Laboratory for Milk and Dairy Products	Croatia
ACTALIA / ACTILAIT / CECALAIT	France	Dairy Research Institute, Pragu (MILCOM a.s.)	Czech Republic
Milchprüfring Baden-Württemberg e.V., Zentrallabor Kirchheim	Germany	Eurofins Steins Laboratorium A/S	Denmark
ÁT. KFT. Tejvizsgáló Laboratórium (Livestock Performance Testing Ltd)	Hungary	VALIO R & D Chemistry	Finland
Teagasc, Technical Services Laboratory	Ireland	Institute of Food Safety, Animal Health and Environment BIOR, Laboratory of Food and Environmental Investigations	Latvia
Central Milk Laboratory – ICBA	Israel	State Laboratory for Milk Control Pieno Tyrimai	Lithuania
Associazione Italiana Allevatori, Laboratorio Standard Latte (LSL-AIA)	Italy	MilkTestNZ	New Zealand
Federazione Latterie Alto Adige Soc. Agr. Coop.	Italy	Livestock Improvement Corporation	New Zealand
Japan Dairy Technical Association	Japan	TINE, Centre for R&D	Norway
Laboratorium Oceny Mleka, Krajowego Centrum Hodowli Zwierzat (KCHZ), Laboratorium Referencyjne z siedziba w Parzniewie	Poland	Milk Laboratory, Slovak Agricultural Research Centre	Slovak Republic
PFHBiPM Laboratorium w Parzniewie	Poland	Veterinárny a potravinový ústav Bratislava	Slovak Republic
PFHBiPM Laboratorium w Bialymstoku zs.w jezewie Starym	Poland	University of Ljubljana, Biotechnical Faculty, Zootech. Dept., Laboratory for Dairying	Slovenia
PFHBiPM Laboratorium w Kobiernie	Poland	Deltamune PTY Ltd	South Africa
PFHBiPM Region Oceny Bydgoszcz z/s w Minikowie	Poland	Eurofins Steins Laboratorium AB	Sweden
Laboratorija za ispitivanje kvaliteta mleka, Poljoprivredni fakultet Novi Sad,	Serbia	Agroscope, Institute for Food Sciences IFS	Switzerland
ANPI Dairy Laboratory	South Africa	Milk Analysis Laboratory, Hsin-chu Branch, Livestock Research Institute, Council of Agriculture	Taiwan
Lab Agroalimentario de Santander	Spain	Office de l'Elevage et des Pâturages, Laboratoire de Contrôle Laitier, Direction de l'Amélioration Génétique	Tunisia
Suisselab AG	Switzerland	Laboratoire d'analyse du lait de Béja, Direction Régionale de l'Office de l'Elevage et des Pâturages	Tunisia
Qlip N.V.	The Netherlands	National Milk Records plc/Direct Laboratories	United Kingdom
Cattle Information Service (CIS)	United Kingdom		
Eastern Laboratory Services	USA		

Attached with this report you find the certificate of your participation in the ICAR Proficiency Testing Scheme March 2016.

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

ICAR - International Committee for Animal Recording
Via Savoia 78, sc. A, int.3,
00198 Rome, Italy

2. Your Performance Analysis and Control Charts

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ICAR Proficiency Test (PT) Chemical "Reference" methods – March 2016

Laboratory Name	Laboratory Name

A – Your participation Codes

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

B – Data received on time

Yes	No	Deadline
		21.03.2016

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

Fat_{ref}	$Protein^{*}_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	SCC_{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 – Outliers

Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	SCC_{alt}
g/100g	g/100g	g/100g	mg/dl	SCC*1000/ml
sample	sample	sample	sample	sample

E – Repeatability

Your "r" performance					Limits					
Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	SCC_{alt}	Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	SCC_{alt}	
g/100g	g/100g	g/100g	mg/dl	SCC*1000/ml	g/100g	g/100g	g/100g	mg/dl	SCC*1000/ml	
					ISO 1211 IDF 1D	ISO 8968 / IDF 20	ISO 22662 IDF 198	ISO IDF 195	ISO 13366-2 IDF 148-2	
					0,043 g/100g	0,038 g/100g	0,06 g/100g	1,52 mg/dl	Level	r
									150	25
									300	42
									450	51
									750	64
									1500	126

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.

F – Z-Score

Your Z-Score PT				
Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	SCC_{alt}
Your FIX Z-Score				
Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	SCC_{alt}

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

G – Ranking of your lab

Mean difference and standard deviation of difference					Indicative Limits defined in the ICAR MA SC				
Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	SCC^{*}_{alt}	Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	SCC*alt
					g/100g	g/100g	g/100g	mg/dl	SCC*1000/ml
					ISO 1211 IDF 1D	ISO 8968 / IDF 20	ISO 22662 IDF 198	ISO IDF 195	ISO 13366-2 IDF 148-2
					d=0,02	d=0,025	d=0,10	d=2,5	d=35
					sd=0,03	sd=0,020	sd=0,10	sd=1,5	sd=35

If d and sd are in the limit (see Table 1 and Figure 1) the cell are in green

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

*For this round the somatic cell ranking is not considered to evaluate the performance of the lab.

Legenda:

- positive performance for all the sample
- same sample showed a performance out of range or there are miss data
- The parameter was not analyzed

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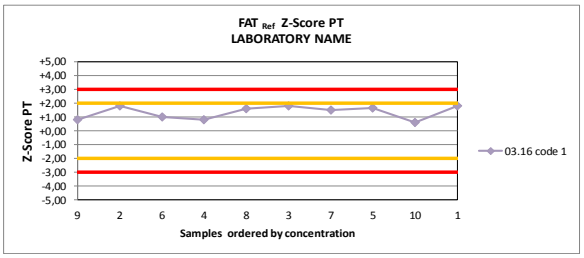
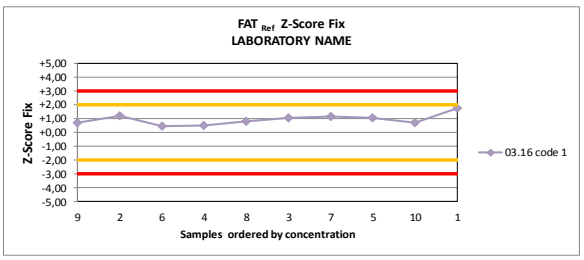
ICAR Proficiency Test (PT) Chemical "Reference" methods – March 2016

H

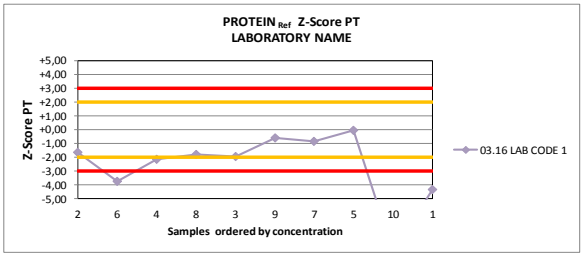
Control Charts

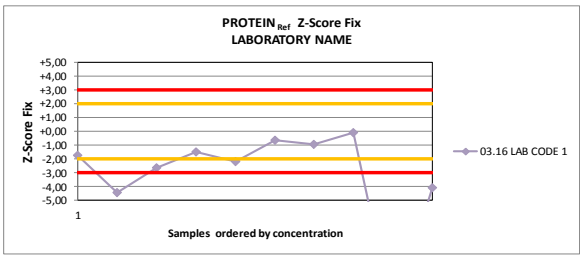
Control Charts Fat





Control Charts Protein





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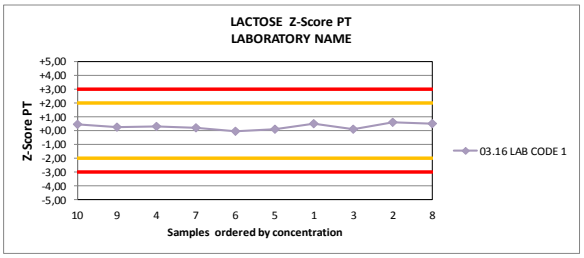
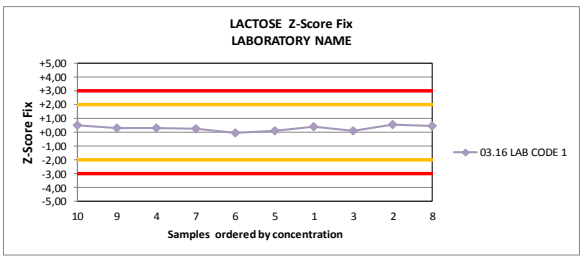
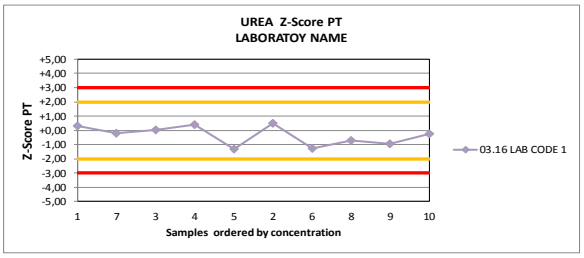
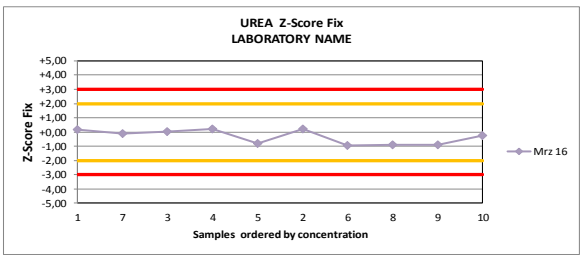
ICAR Proficiency Test (PT) Chemical "Reference" methods – March 2016
Control Charts Lactose





Control Charts Urea





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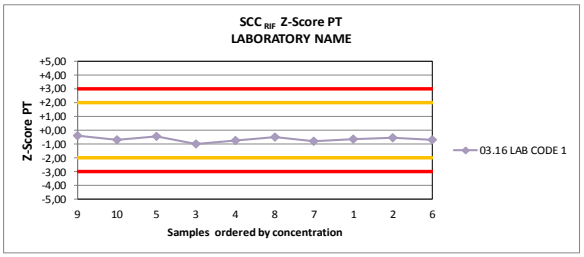
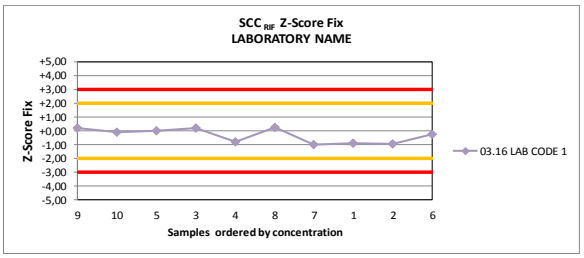
ICAR Proficiency Test (PT) Chemical "Reference" methods – March 2016

Control Charts SCC





3. ICAR Statistical elaboration

ICAR
PROFICIENCY TESTING SCHEME

March 2016

Raw Milk

Determination of FAT CONTENT
Röse Gottlieb method

Sending date of statistical treatment : 19th april 2016

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)	
Contact :	Gavin Scott	gavin@milktest.co.nz
ICAR Staff	Silvia Orlandini	pt@icar.org silvia@icar.org

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

Nb	%	N°	d	Sd	D	Method
1	7	10	- 0,002	0,004	0,004	A
2	13	9	+ 0,003	0,004	0,005	A
3	20	2	+ 0,001	0,005	0,005	A
4	27	13	- 0,005	0,003	0,006	A
5	33	14	- 0,004	0,005	0,006	A
6	40	3	- 0,006	0,003	0,007	A
7	47	11	+ 0,004	0,006	0,007	A
8	53	15	- 0,004	0,012	0,012	A
9	60	7	- 0,010	0,013	0,017	A
10	67	12	- 0,001	0,019	0,019	B
11	73	1	+ 0,019	0,008	0,020	A
12	80	5	+ 0,007	0,020	0,021	A
13	87	6	- 0,001	0,025	0,025	B
14	93	4	- 0,033	0,012	0,035	A
15	100	8	- 0,036	0,156	0,160	A

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

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

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

A ISO 1211 IDF 1D 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} 0,015

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

Sample/Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0,022 *	0,002	0,011	0,011	0,005	0,002	0,008	0,013	0,010	0,004	0,007	20
2	0,001	0,004	0,004	0,005	0,001	0,000	0,003	0,004	0,001	0,002	0,002	20
3	0,004	0,002	0,008	0,030 *	0,000	0,001	0,009	0,004	0,004	0,013	0,008	20
4	0,003	0,009	0,022	0,014	0,003	0,006	0,001	0,022	0,020	0,007	0,009	20
5	0,000	0,020	0,000	0,000	0,000	0,000	0,000	0,010	0,020	0,000	0,007	20
6	0,000	0,000	0,010	0,000	0,029 *	0,000	0,029 *	0,019	0,000	0,000	0,010	20
7	0,004	0,005	0,014	0,006	0,012	0,007	0,004	0,016	0,010	0,024	0,008	20
8	0,009	0,001	0,002	0,002	0,001	0,007	1,006 *	0,001	0,008	0,018	0,225	20
9	0,006	0,005	0,006	0,005	0,002	0,000	0,006	0,003	0,003	0,007	0,003	20
10	0,007	0,011	0,006	0,008	0,011	0,003	0,007	0,003	0,005	0,000	0,005	20
11	0,012	0,004	0,003	0,005	0,000	0,004	0,007	0,003	0,004	0,000	0,004	20
12	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	20
13	0,002	0,010	0,004	0,008	0,012	0,006	0,009	0,003	0,006	0,005	0,005	20
14	0,002	0,008	0,004	0,003	0,001	0,002	0,002	0,001	0,005	0,005	0,003	20
15	0,006	0,003	0,006	0,003	0,001	0,001	0,001	0,004	0,006	0,008	0,003	20
Sr	0,005	0,005	0,006	0,007	0,007	0,003	0,184	0,007	0,006	0,007		300
NE	30	30	30	30	30	30	30	30	30	30		
L	0,014	0,020	0,023	0,017	0,015	0,010	0,014	0,026	0,024	0,025		

Sr : repeatability standard deviation of each laboratory limit 0,016 g/100g
NL : number of measurements per laboratory
L : Limit for difference between duplicates according Cochran test at 5% level.
SE : repeatability standard deviation per sample
NE : number of measurements per sample
*: discarded data using the test of Cochran at 5 %
** : missing data
r : limit of repeatability, absolute difference betwen two replicates=0,043 according ISO 1211 IDF 1D 2010

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	4,775	2,169	3,518	2,840	4,191	2,443	3,859	3,131	1,504	4,540
2	4,739	2,140	3,495	2,831	4,170	2,431	3,844	3,115	1,491	4,537
3	4,735	2,143	3,487	2,824	4,163	2,427	3,823	3,106	1,487	4,522
4	4,708	2,119	3,468	2,795	4,114 *	2,390 *	3,799	3,105	1,464	4,490
5	4,740	2,160	3,510	2,850	4,170	2,450	3,850	3,125	1,510	4,480
6	4,786	2,136	3,500	2,816	4,151	2,427	3,821	3,117	1,456	4,563
7	4,735	2,157	3,498	2,830	4,137	2,418	3,813	3,093	1,481	4,514
8	4,756	2,156	3,509	2,837	4,175	2,450	3,355 *	3,131	1,505	4,550
9	4,748	2,151	3,496	2,830	4,171	2,433	3,844	3,116	1,493	4,533
10	4,740	2,143	3,489	2,831	4,171	2,429	3,837	3,109	1,485	4,528
11	4,751	2,141	3,503	2,836	4,182	2,439	3,841	3,111	1,484	4,531
12	4,757	2,136	3,495	2,816	4,175	2,427	3,835	3,107	1,456	4,563
13	4,739	2,140	3,495	2,821	4,160	2,426	3,833	3,108	1,484	4,525
14	4,730	2,142	3,495	2,829	4,167	2,431	3,838	3,112	1,476	4,520
15	4,724	2,125	3,485	2,817	4,163	2,429	3,838	3,123	1,504	4,533
M	4,744	2,144	3,496	2,827	4,167	2,433	3,834	3,114	1,485	4,528
REF.	4,740	2,145	3,496	2,829	4,169	2,434	3,836	3,114	1,490	4,526
SD	0,019	0,013	0,012	0,013	0,013	0,009	0,016	0,010	0,017	0,023

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

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

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran	1			3	6		6;8			
Outlier Grubbs					4	4	8			
sr	0,004	0,005	0,006	0,005	0,004	0,002	0,004	0,007	0,006	0,007
SR	0,018	0,014	0,013	0,014	0,013	0,010	0,016	0,011	0,018	0,023

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

Sample / Lab Code	1	2	3	4	5	6	7	8	9	10	d	Sd_{lab}	t
1	+ 0,035	+ 0,024	+ 0,021	+ 0,010	+ 0,021	+ 0,009	+ 0,023	+ 0,016	+ 0,014	+ 0,014	+ 0,019	0,008	7,64
2	- 0,001	- 0,005	- 0,001	+ 0,001	+ 0,000	- 0,003	+ 0,008	+ 0,001	+ 0,000	+ 0,011	+ 0,001	0,005	0,75
3	- 0,005	- 0,002	- 0,009	- 0,005	- 0,006	- 0,007	- 0,013	- 0,008	- 0,003	- 0,004	- 0,006	0,003	6,07
4	- 0,032	- 0,027	- 0,028	- 0,034	- 0,056	- 0,044	- 0,037	- 0,009	- 0,026	- 0,036	- 0,033	0,012	8,58
5	+ 0,000	+ 0,015	+ 0,014	+ 0,021	+ 0,001	+ 0,016	+ 0,014	+ 0,011	+ 0,020	- 0,046	+ 0,007	0,020	1,06
6	+ 0,046	- 0,009	+ 0,004	- 0,013	- 0,019	- 0,007	- 0,015	+ 0,002	- 0,034	+ 0,037	- 0,001	0,025	0,10
7	- 0,005	+ 0,011	+ 0,002	+ 0,001	- 0,032	- 0,016	- 0,023	- 0,021	- 0,009	- 0,012	- 0,010	0,013	2,51
8	+ 0,016	+ 0,010	+ 0,013	+ 0,008	+ 0,005	+ 0,016	- 0,481	+ 0,016	+ 0,015	+ 0,024	- 0,036	0,156	0,72
9	+ 0,008	+ 0,005	- 0,000	+ 0,000	+ 0,002	- 0,001	+ 0,008	+ 0,001	+ 0,002	+ 0,007	+ 0,003	0,004	2,98
10	- 0,000	- 0,003	- 0,007	+ 0,002	+ 0,001	- 0,005	+ 0,001	- 0,006	- 0,006	+ 0,002	- 0,002	0,004	1,77
11	+ 0,011	- 0,004	+ 0,006	+ 0,006	+ 0,013	+ 0,005	+ 0,005	- 0,004	- 0,006	+ 0,005	+ 0,004	0,006	1,86
12	+ 0,017	- 0,009	- 0,001	- 0,013	+ 0,006	- 0,007	- 0,001	- 0,007	- 0,034	+ 0,037	- 0,001	0,019	0,20
13	- 0,001	- 0,005	- 0,001	- 0,008	- 0,009	- 0,008	- 0,003	- 0,007	- 0,006	- 0,001	- 0,005	0,003	5,03
14	- 0,010	- 0,003	- 0,002	- 0,001	- 0,002	- 0,002	+ 0,002	- 0,003	- 0,014	- 0,006	- 0,004	0,005	2,70
15	- 0,016	- 0,021	- 0,011	- 0,013	- 0,007	- 0,005	+ 0,002	+ 0,009	+ 0,014	+ 0,007	- 0,004	0,012	1,11
d	+ 0,004	- 0,001	- 0,000	- 0,003	- 0,002	- 0,001	- 0,002	- 0,001	- 0,005	+ 0,003	- 0,005	0,042	
Sd	0,019	0,013	0,012	0,013	0,013	0,009	0,016	0,010	0,017	0,023	0,015		

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

Upper limits : $\bar{d}$ = +/- 0,02 g / 100 g Sd = 0,03 g / 100g

ISO 1211 (2010) : Precision of the method : Sr = 0.016 g / 100 g
SR = 0.020 g / 100 g

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+1,82	+1,82	+1,79	+0,79	+1,65	+0,99	+1,49	+1,58	+0,82	+0,62
2	-0,06	-0,38	-0,12	+0,09	+0,04	-0,28	+0,50	+0,07	+0,02	+0,49
3	-0,24	-0,15	-0,81	-0,42	-0,46	-0,76	-0,85	-0,80	-0,18	-0,19
4	-1,65	-2,02	-2,42	-2,67	-4,27	-4,65	-2,39	-0,90	-1,53	-1,59
5	+0,02	+1,14	+1,15	+1,60	+0,08	+1,74	+0,92	+1,05	+1,17	-2,01
6	+2,39	-0,69	+0,30	-1,04	-1,42	-0,71	-0,98	+0,22	-2,00	+1,63
7	-0,24	+0,87	+0,13	+0,05	-2,46	-1,72	-1,46	-2,07	-0,54	-0,52
8	+0,82	+0,80	+1,07	+0,59	+0,42	+1,69	-30,82	+1,58	+0,87	+1,06
9	+0,43	+0,42	-0,04	+0,01	+0,15	-0,07	+0,53	+0,12	+0,14	+0,29
10	-0,01	-0,19	-0,64	+0,13	+0,11	-0,55	+0,05	-0,56	-0,33	+0,10
11	+0,59	-0,31	+0,51	+0,48	+1,00	+0,57	+0,31	-0,36	-0,36	+0,23
12	+0,90	-0,69	-0,12	-1,04	+0,46	-0,71	-0,05	-0,70	-2,00	+1,63
13	-0,03	-0,38	-0,12	-0,65	-0,69	-0,82	-0,21	-0,66	-0,36	-0,06
14	-0,49	-0,25	-0,16	-0,07	-0,14	-0,24	+0,13	-0,26	-0,83	-0,25
15	-0,80	-1,56	-0,98	-1,00	-0,50	-0,55	+0,11	+0,85	+0,82	+0,31

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

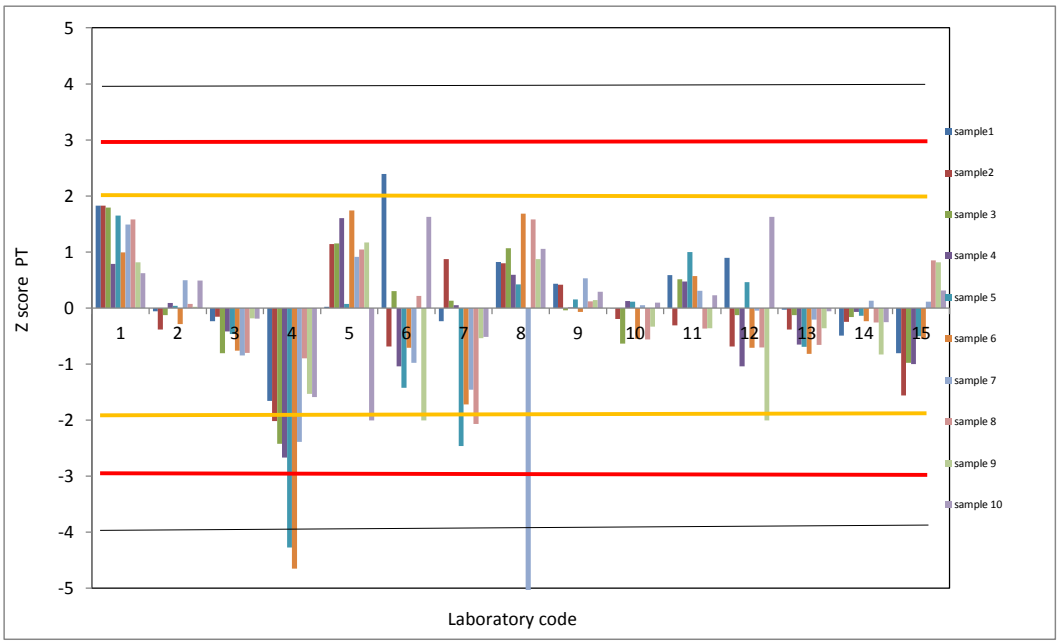


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

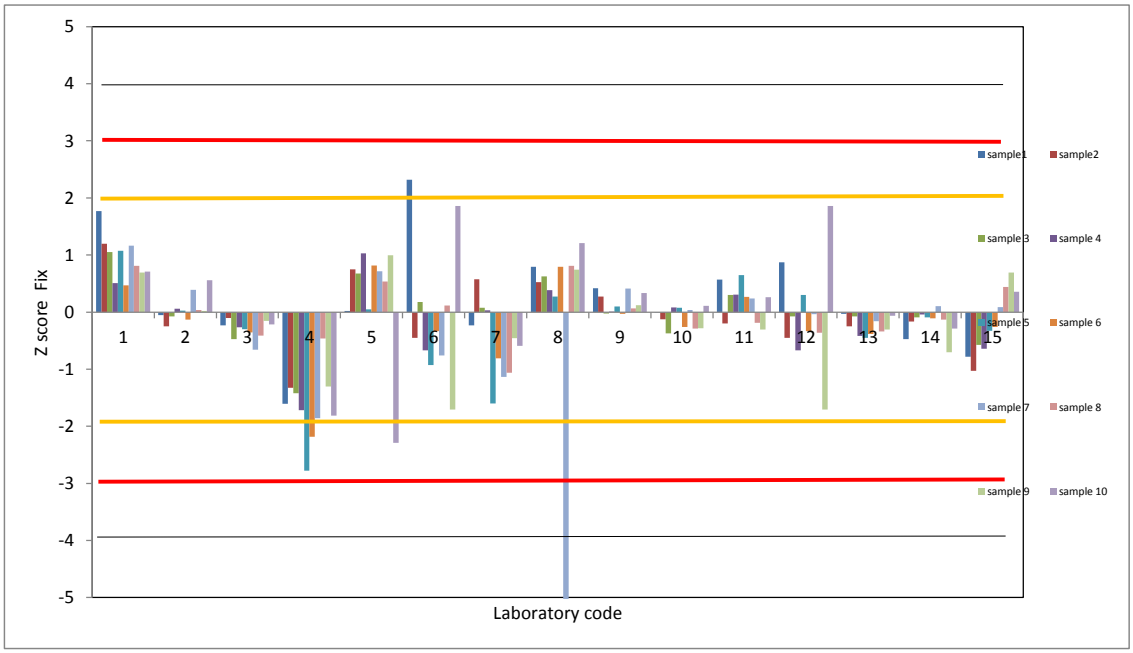
Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+1,77	+1,20	+1,05	+0,51	+1,07	+0,47	+1,16	+0,81	+0,69	+0,71
2	-0,05	-0,25	-0,07	+0,06	+0,02	-0,13	+0,39	+0,04	+0,02	+0,56
3	-0,23	-0,10	-0,47	-0,27	-0,30	-0,36	-0,66	-0,41	-0,16	-0,22
4	-1,60	-1,33	-1,42	-1,72	-2,78	-2,18	-1,86	-0,46	-1,31	-1,82
5	+0,02	+0,75	+0,68	+1,03	+0,05	+0,82	+0,71	+0,54	+0,99	-2,29
6	+2,32	-0,45	+0,18	-0,67	-0,93	-0,33	-0,76	+0,11	-1,71	+1,86
7	-0,23	+0,57	+0,08	+0,03	-1,60	-0,81	-1,14	-1,06	-0,46	-0,59
8	+0,80	+0,52	+0,63	+0,38	+0,27	+0,79	-24,04	+0,81	+0,74	+1,21
9	+0,42	+0,27	-0,02	+0,01	+0,10	-0,03	+0,41	+0,06	+0,12	+0,33
10	-0,00	-0,13	-0,37	+0,08	+0,07	-0,26	+0,04	-0,29	-0,28	+0,11
11	+0,57	-0,20	+0,30	+0,31	+0,65	+0,27	+0,24	-0,19	-0,31	+0,26
12	+0,87	-0,45	-0,07	-0,67	+0,30	-0,33	-0,04	-0,36	-1,71	+1,86
13	-0,03	-0,25	-0,07	-0,42	-0,45	-0,38	-0,16	-0,34	-0,31	-0,07
14	-0,48	-0,16	-0,09	-0,04	-0,09	-0,11	+0,10	-0,13	-0,70	-0,29
15	-0,78	-1,03	-0,57	-0,64	-0,33	-0,26	+0,09	+0,44	+0,69	+0,36

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

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

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

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



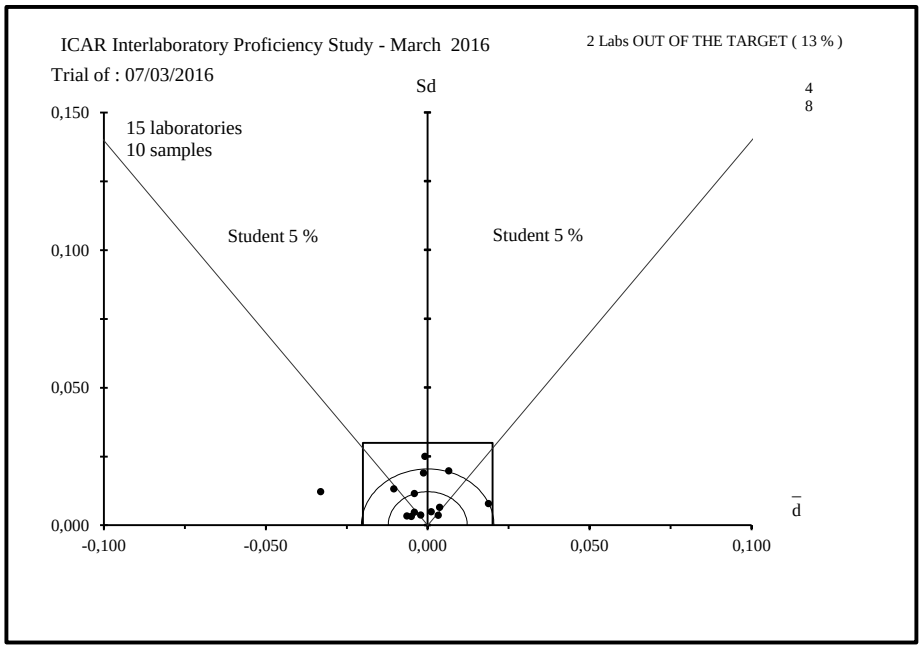


Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST
RAW MILK
FAT CONTENT Röse Göttlieb
March 2016

Name	City	Country
AIA-LAB. STANDARD LATTE	MACARESE (ROMA)	ITALY
CENTRAL MILK LABORATORY - ICBA	CAESAREA	ISRAEL
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
EASTERN LAB SERVICES	MEDINA	USA
ESTONIAN LIVESTOCK PERFORMANCE RECORDING LTD	TARTU	ESTONIA
ILVO - T.V.	MELLE	BELGIUM
JAPAN DAIRY TECHNICAL ASSOCIATION	TOKYO	JAPAN
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LOM KCHZ LABORATORIM REFERENCYJNE	PRUSZKOW	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
QLIP N.V.	CM ZUTPHEN	NETHERLAND
TEAGASC FOOD RESEARCH CENTER	FERMOY CO-CORK	IRELAND
VALACTA	STE ANNE DE BELLEVUE	CANADA

ICAR
PROFICIENCY TESTING SCHEME

March 2016

Raw Milk

Determination of CRUDE PROTEIN CONTENT
KJELDAHL Method

Sending date of statistical treatment : 19th april 2016

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)	
Contact :	Gavin Scott	gavin@milktest.co.nz
ICAR Staff	Silvia Orlandini	pt@icar.org silvia@icar.org

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

Nb	%	N°	d	Sd	D
1	7	9	- 0,000	0,007	0,007
2	13	2	+ 0,001	0,008	0,008
3	20	6	- 0,001	0,012	0,012
4	27	15	- 0,004	0,011	0,012
5	33	4	- 0,014	0,005	0,015
6	40	12	- 0,014	0,007	0,015
7	47	10	+ 0,014	0,007	0,016
8	53	8	- 0,016	0,006	0,017
9	60	11	+ 0,015	0,007	0,017
10	67	14	+ 0,013	0,017	0,021
11	73	13	+ 0,019	0,011	0,022
12	80	3	+ 0,022	0,010	0,025
13	87	5	+ 0,020	0,029	0,035
14	93	7	- 0,037	0,013	0,039
15	100	1	- 0,057	0,069	0,089

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 15 laboratories using the reference method (ISO 8968 / IDF 20), 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} 0,009
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %) SR_{PT} 0,021

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	0,001	0,001	0,001	0,000	0,000	0,001	0,001	0,450 *	0,101	20
2	0,002	0,001	0,013	0,002	0,001	0,011	0,013	0,003	0,003	0,030	0,008	20
3	0,038 *	0,006	0,006	0,013	0,019	0,006	0,006	0,006	0,006	0,000	0,011	20
4	0,007	0,008	0,010	0,001	0,008	0,001	0,001	0,001	0,011	0,006	0,005	20
5	0,014	0,012	0,073 *	0,004	0,034	0,043 *	0,007	0,015	0,024	0,035	0,023	20
6	0,010	0,006	0,023	0,010	0,044	0,006	0,016	0,001	0,037	0,017	0,015	20
7	0,017	0,006	0,025	0,003	0,011	0,010	0,014	0,019	0,012	0,010	0,010	20
8	0,027	0,029 *	0,029	0,009	0,014	0,014	0,004	0,004	0,008	0,009	0,012	20
9	0,008	0,002	0,003	0,001	0,001	0,001	0,003	0,002	0,014	0,000	0,004	20
10	0,000	0,006	0,004	0,004	0,003	0,005	0,003	0,001	0,012	0,001	0,004	20
11	0,001	0,002	0,005	0,008	0,011	0,012	0,009	0,014	0,011	0,011	0,007	20
12	0,005	0,003	0,007	0,010	0,006	0,000	0,001	0,001	0,003	0,007	0,004	20
13	0,005	0,005	0,018	0,003	0,010	0,000	0,023	0,021	0,018	0,005	0,009	20
14	0,013	0,010	0,011	0,003	0,001	0,013	0,013	0,008	0,006	0,040	0,011	20
15	0,003	0,003	0,015	0,001	0,004	0,029 *	0,016	0,001	0,002	0,004	0,008	20
Sr	0,010	0,007	0,017	0,004	0,012	0,011	0,008	0,007	0,010	0,083		300
NE	30	30	30	30	30	30	30	30	30	30		
L	0,028	0,016	0,039	0,016	0,044	0,021	0,029	0,025	0,039	0,047		

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=0,038 according ISO 8968 / IDF 20

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

Sample / Lab Code	1	2	3	4	5	6	7	8	9	10
1	3,652 *	2,678	3,210	2,843	3,534	2,721 *	3,415	3,054	3,253	3,390 *
2	3,735	2,712	3,252	2,899	3,542	2,793	3,438	3,070	3,267	3,618
3	3,726	2,734	3,270	2,928	3,570	2,823	3,448	3,097	3,283	3,656
4	3,714	2,691	3,244	2,881	3,521	2,783	3,417	3,056	3,251	3,613
5	3,734	2,739	3,257	2,880	3,555	2,852	3,444	3,159 *	3,244	3,651
6	3,724	2,724	3,249	2,900	3,508	2,802	3,423	3,080	3,260	3,636
7	3,687	2,675	3,204	2,859	3,494	2,765	3,387	3,074	3,220	3,577
8	3,711	2,699	3,238	2,868	3,513	2,785	3,416	3,073	3,248	3,603
9	3,735	2,704	3,249	2,890	3,526	2,796	3,439	3,072	3,275	3,623
10	3,744	2,718	3,255	2,919	3,543	2,806	3,454	3,093	3,277	3,642
11	3,740	2,723	3,268	2,895	3,558	2,814	3,457	3,083	3,283	3,646
12	3,710	2,704	3,231	2,881	3,520	2,789	3,411	3,076	3,252	3,602
13	3,749	2,723	3,276	2,902	3,560	2,818	3,461	3,100	3,293	3,624
14	3,727	2,707	3,253	2,899	3,544	2,807	3,440	3,098	3,275	3,687
15	3,706	2,696	3,245	2,901	3,529	2,788	3,417	3,091	3,265	3,635
M	3,724	2,708	3,247	2,890	3,534	2,802	3,431	3,080	3,263	3,629
REF.	3,725	2,709	3,248	2,890	3,535	2,800	3,432	3,080	3,264	3,629
SD	0,017	0,019	0,020	0,022	0,021	0,021	0,021	0,015	0,019	0,027

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 15 laboratories using the reference method ISO 8968 / IDF 20, after outliers discarging using Grubbs test at 5 % risk level.

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran	3	8	5			5;15				1
Outlier Grubbs	1					1		5		1
sr	0,008	0,004	0,011	0,004	0,012	0,006	0,008	0,006	0,010	0,013
SR	0,019	0,020	0,022	0,022	0,023	0,017	0,021	0,016	0,020	0,029

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

Sample / Lab Code	1	2	3	4	5	6	7	8	9	10	d	Sd_{lab}	t
1	- 0,074	- 0,031	- 0,039	- 0,048	- 0,001	- 0,079	- 0,017	- 0,026	- 0,011	- 0,239	- 0,057	0,069	2,60
2	+ 0,010	+ 0,004	+ 0,003	+ 0,009	+ 0,007	- 0,007	+ 0,006	- 0,010	+ 0,003	- 0,011	+ 0,001	0,008	0,53
3	+ 0,001	+ 0,025	+ 0,021	+ 0,038	+ 0,035	+ 0,023	+ 0,016	+ 0,018	+ 0,019	+ 0,027	+ 0,022	0,010	6,75
4	- 0,012	- 0,018	- 0,004	- 0,010	- 0,014	- 0,018	- 0,016	- 0,024	- 0,013	- 0,016	- 0,014	0,005	8,57
5	+ 0,008	+ 0,030	+ 0,008	- 0,011	+ 0,020	+ 0,052	+ 0,012	+ 0,079	- 0,020	+ 0,022	+ 0,020	0,029	2,22
6	- 0,001	+ 0,015	+ 0,001	+ 0,010	- 0,027	+ 0,002	- 0,009	+ 0,000	- 0,004	+ 0,007	- 0,001	0,012	0,20
7	- 0,038	- 0,033	- 0,045	- 0,032	- 0,040	- 0,036	- 0,045	- 0,006	- 0,044	- 0,052	- 0,037	0,013	9,30
8	- 0,014	- 0,010	- 0,010	- 0,022	- 0,022	- 0,015	- 0,016	- 0,007	- 0,016	- 0,026	- 0,016	0,006	8,17
9	+ 0,010	- 0,004	+ 0,000	- 0,001	- 0,009	- 0,004	+ 0,007	- 0,008	+ 0,011	- 0,006	- 0,000	0,007	0,16
10	+ 0,019	+ 0,010	+ 0,007	+ 0,029	+ 0,008	+ 0,006	+ 0,022	+ 0,013	+ 0,013	+ 0,013	+ 0,014	0,007	5,91
11	+ 0,015	+ 0,014	+ 0,020	+ 0,004	+ 0,024	+ 0,014	+ 0,025	+ 0,003	+ 0,019	+ 0,017	+ 0,015	0,007	6,72
12	- 0,015	- 0,005	- 0,018	- 0,009	- 0,015	- 0,011	- 0,021	- 0,004	- 0,012	- 0,027	- 0,014	0,007	6,04
13	+ 0,024	+ 0,014	+ 0,028	+ 0,011	+ 0,026	+ 0,018	+ 0,029	+ 0,020	+ 0,029	- 0,005	+ 0,019	0,011	5,84
14	+ 0,001	- 0,001	+ 0,004	+ 0,009	+ 0,010	+ 0,006	+ 0,008	+ 0,018	+ 0,012	+ 0,058	+ 0,013	0,017	2,35
15	- 0,020	- 0,012	- 0,004	+ 0,011	- 0,006	- 0,013	- 0,015	+ 0,012	+ 0,001	+ 0,006	- 0,004	0,011	1,14
d	- 0,001	- 0,000	- 0,002	- 0,001	- 0,000	+ 0,001	- 0,001	- 0,000	- 0,001	+ 0,000	- 0,003	0,030	
Sd	0,017	0,019	0,020	0,022	0,021	0,021	0,021	0,015	0,019	0,027	0,021		

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

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

ISO 8968 / IDF 20 : 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	-4,32	-1,65	-1,93	-2,15	-0,06	-3,72	-0,82	-1,77	-0,60	-8,80
2	+0,59	+0,21	+0,15	+0,39	+0,32	-0,32	+0,27	-0,64	+0,14	-0,41
3	+0,04	+1,34	+1,05	+1,72	+1,63	+1,07	+0,79	+1,18	+0,98	+0,99
4	-0,68	-0,93	-0,22	-0,44	-0,64	-0,84	-0,75	-1,64	-0,71	-0,59
5	+0,49	+1,60	+0,42	-0,48	+0,94	+2,43	+0,59	+5,29	-1,04	+0,81
6	-0,07	+0,80	+0,04	+0,46	-1,25	+0,08	-0,46	+0,00	-0,23	+0,25
7	-2,24	-1,77	-2,22	-1,42	-1,89	-1,67	-2,16	-0,38	-2,34	-1,90
8	-0,81	-0,51	-0,50	-1,01	-1,03	-0,70	-0,75	-0,47	-0,84	-0,94
9	+0,57	-0,23	+0,01	-0,03	-0,41	-0,19	+0,33	-0,51	+0,58	-0,21
10	+1,09	+0,51	+0,33	+1,31	+0,39	+0,26	+1,08	+0,86	+0,70	+0,47
11	+0,87	+0,75	+0,99	+0,20	+1,11	+0,63	+1,19	+0,20	+0,98	+0,61
12	-0,89	-0,25	-0,89	-0,42	-0,71	-0,52	-1,01	-0,25	-0,64	-1,00
13	+1,39	+0,76	+1,38	+0,52	+1,20	+0,82	+1,40	+1,36	+1,52	-0,18
14	+0,08	-0,08	+0,20	+0,42	+0,45	+0,30	+0,40	+1,20	+0,61	+2,14
15	-1,15	-0,65	-0,20	+0,50	-0,28	-0,59	-0,70	+0,77	+0,06	+0,21

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

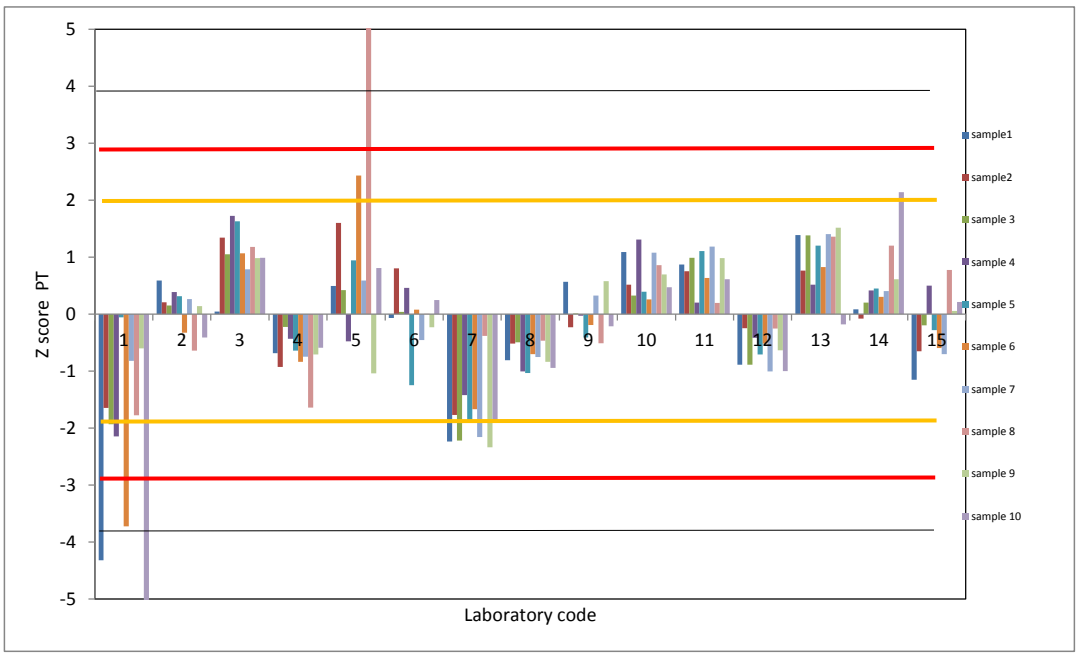


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

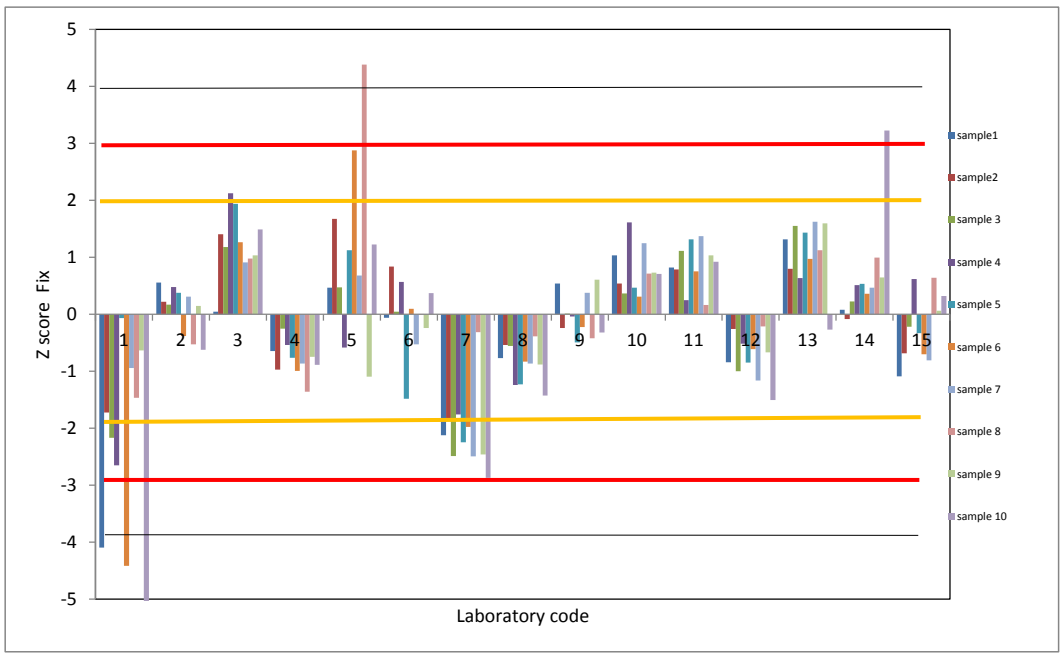
Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-4,09	-1,72	-2,17	-2,65	-0,07	-4,41	-0,95	-1,47	-0,63	-13,28
2	+0,56	+0,22	+0,17	+0,48	+0,38	-0,38	+0,31	-0,53	+0,15	-0,62
3	+0,04	+1,41	+1,18	+2,13	+1,94	+1,26	+0,91	+0,98	+1,03	+1,49
4	-0,65	-0,97	-0,25	-0,54	-0,76	-0,99	-0,86	-1,36	-0,74	-0,89
5	+0,47	+1,67	+0,47	-0,59	+1,12	+2,88	+0,68	+4,38	-1,09	+1,22
6	-0,06	+0,84	+0,05	+0,57	-1,48	+0,09	-0,53	+0,00	-0,24	+0,37
7	-2,12	-1,85	-2,49	-1,76	-2,25	-1,98	-2,49	-0,32	-2,46	-2,87
8	-0,77	-0,54	-0,56	-1,24	-1,23	-0,83	-0,87	-0,39	-0,88	-1,42
9	+0,54	-0,24	+0,01	-0,04	-0,49	-0,22	+0,38	-0,42	+0,61	-0,32
10	+1,03	+0,54	+0,37	+1,61	+0,47	+0,31	+1,25	+0,71	+0,73	+0,71
11	+0,82	+0,79	+1,11	+0,25	+1,32	+0,75	+1,37	+0,16	+1,03	+0,92
12	-0,84	-0,26	-1,00	-0,52	-0,85	-0,61	-1,16	-0,21	-0,67	-1,51
13	+1,31	+0,80	+1,55	+0,64	+1,43	+0,97	+1,62	+1,13	+1,59	-0,27
14	+0,08	-0,08	+0,22	+0,51	+0,54	+0,36	+0,47	+0,99	+0,64	+3,22
15	-1,09	-0,68	-0,22	+0,62	-0,33	-0,70	-0,81	+0,64	+0,06	+0,32

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



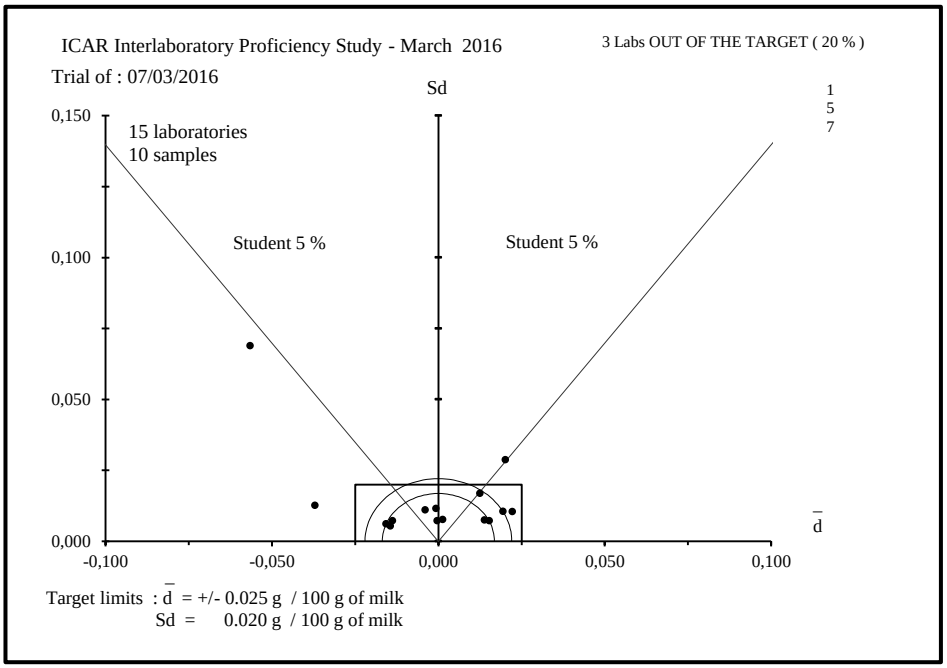


Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST
RAW MILK
NITROGEN CONTENT
March 2016

Name	City	Country
ACTALIA-Cecalait	POLIGNY	FRANCE
AIA-LAB. STANDARD LATTE	MACCARESE (ROMA)	ITALY
CENTRAL MILK LABORATORY - ICBA	CAESAREA	ISRAEL
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
EASTERN LAB SERVICES	MEDINA	USA
ESTONIAN LIVESTOCK PERFORMANCE RECORDING LTD	TARTU	ESTONIA
ILVO - T.V.	MELLE	BELGIUM
JAPAN DAIRY TECHNICAL ASSOCIATION	TOKYO	JAPAN
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LOM KCHZ LABORATORIM REFERENCYJNE	PRUSZKOW	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
QLIP N.V.	CM ZUTPHEN	NETHERLAND
TEAGASC FOOD RESEARCH CENTER	FERMOY CO-CORK	IRELAND
VALACTA	STE ANNE DE BELLEVUE	CANADA

ICAR
PROFICIENCY TESTING SCHEME

March 2016

Raw Milk

Determination of LACTOSE CONTENT

Sending date of statistical treatment : 19th april 2016

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)	
Contact :	Gavin Scott	gavin@milktest.co.nz
ICAR Staff	Silvia Orlandini	pt@icar.org silvia@icar.org

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

Nb	%	N°	d	Sd	D	**Method**
1	8	2	- 0,009	0,012	0,015	Polarimeter
2	17	1	+ 0,013	0,009	0,016	Internal chemical method
3	25	7	+ 0,008	0,021	0,023	Gravimetric
4	33	6	+ 0,030	0,009	0,031	HPLC
5	42	5	+ 0,032	0,018	0,037	HPLC
6	50	10	- 0,035	0,016	0,038	Infra red
7	58	9	- 0,036	0,019	0,040	Lane-Eynon
8	67	8	+ 0,005	0,041	0,041	diff.pH
9	75	12	+ 0,048	0,034	0,059	HPLC
10	83	4	- 0,044	0,041	0,060	diff.pH
11	92	3	- 0,071	0,024	0,075	Enzymatic
12	100	11	+ 0,100	0,055	0,114	Continuous flow

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

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 12 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}	0,010
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,047

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	0,004	0,008	0,002	0,006	0,003	0,003	0,004	0,003	0,004	0,003	20
2	0,000	0,010	0,000	0,010	0,000	0,010	0,010	0,000	0,000	0,000	0,004	20
3	0,018	0,000	0,018	0,019	0,018	0,018	0,019	0,000	0,000	0,000	0,010	20
4	0,014	0,004	0,016	0,012	0,011	0,001	0,003	0,006	0,017	0,004	0,007	20
5	0,015	0,009	0,025	0,011	0,016	0,015	0,003	0,009	0,024	0,036 *	0,013	20
6	0,008	0,005	0,003	0,004	0,006	0,001	0,008	0,002	0,012	0,013	0,005	20
7	0,001	0,006	0,002	0,000	0,001	0,000	0,010	0,002	0,010	0,007	0,004	20
8	0,028	0,013	0,006	0,022	0,079 *	0,052	0,043 *	0,047 *	0,061 *	0,001	0,030	20
9	0,002	0,003	0,019	0,000	0,005	0,002	0,004	0,005	0,006	0,003	0,005	20
10	0,000	0,000	0,000	0,000	0,000	0,020	0,000	0,000	0,000	0,000	0,004	20
11	0,060 *	0,030 *	0,090 *	0,030	0,010	0,030	0,010	0,030 *	0,030	0,020	0,029	20
12	0,008	0,004	0,007	0,005	0,001	0,021	0,007	0,006	0,032	0,020	0,010	20
Sr	0,015	0,008	0,020	0,009	0,017	0,015	0,011	0,012	0,017	0,010		240
NE	24	24	24	24	24	24	24	24	24	24		
L	0,031	0,016	0,031	0,034	0,023	0,053	0,022	0,011	0,042	0,025		

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	4,910	5,051	4,975	4,776	4,841	4,820	4,784	5,110	4,742	4,665
2	4,880	5,025	4,970	4,755	4,840	4,795	4,765	5,090	4,720	4,610
3	4,848	4,960	4,870	4,662	4,765	4,758	4,695	4,990	4,671	4,607
4	4,817	4,997	4,946	4,755	4,845	4,826	4,725	5,031	4,631	4,530
5	4,951	5,090	5,010	4,796	4,854	4,847	4,793	5,120	4,739	4,664
6	4,916	5,053	4,988	4,790	4,862	4,843	4,808	5,131	4,771	4,674
7	4,914	5,064	4,982	4,746	4,862	4,800	4,771	5,121	4,731	4,632
8	4,873	4,983	4,941	4,762	4,855	4,917	4,746	5,131	4,744	4,638
9	4,875	4,993	4,955	4,738	4,789	4,751	4,760	5,038	4,689	4,596
10	4,870	5,010	4,940	4,710	4,800	4,770	4,720	5,080	4,680	4,610
11	5,060 *	5,205 *	5,075	4,835	5,005 *	4,865	4,865	5,115	4,795	4,720
12	4,925	5,061	5,001	4,797	4,876	4,889	4,847	5,072	4,830	4,726
M	4,889	5,026	4,971	4,760	4,835	4,823	4,773	5,086	4,728	4,639
REF.	4,890	5,026	4,971	4,762	4,837	4,822	4,772	5,088	4,728	4,641
SD	0,038	0,041	0,049	0,045	0,035	0,052	0,050	0,045	0,056	0,055

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

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran	11	11	11		8		8	8;11	8	5
Outlier Grubbs	11	11			11					
sr	0,009	0,005	0,009	0,009	0,006	0,015	0,006	0,003	0,012	0,007
SR	0,039	0,041	0,039	0,046	0,037	0,053	0,052	0,046	0,059	0,057

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	+ 0,025	+ 0,004	+ 0,014	+ 0,004	- 0,003	+ 0,011	+ 0,022	+ 0,013	+ 0,024	+ 0,013	0,009	4,53
2	- 0,010	- 0,001	- 0,001	- 0,007	+ 0,003	- 0,027	- 0,007	+ 0,002	- 0,008	- 0,031	- 0,009	0,012	2,36
3	- 0,042	- 0,066	- 0,101	- 0,101	- 0,072	- 0,064	- 0,078	- 0,098	- 0,057	- 0,034	- 0,071	0,024	9,55
4	- 0,073	- 0,029	- 0,025	- 0,007	+ 0,008	+ 0,003	- 0,048	- 0,057	- 0,098	- 0,111	- 0,044	0,041	3,35
5	+ 0,061	+ 0,064	+ 0,039	+ 0,033	+ 0,017	+ 0,024	+ 0,020	+ 0,031	+ 0,011	+ 0,023	+ 0,032	0,018	5,78
6	+ 0,026	+ 0,027	+ 0,017	+ 0,028	+ 0,025	+ 0,020	+ 0,036	+ 0,043	+ 0,043	+ 0,032	+ 0,030	0,009	10,66
7	+ 0,024	+ 0,038	+ 0,011	- 0,016	+ 0,025	- 0,022	- 0,001	+ 0,033	+ 0,003	- 0,010	+ 0,008	0,021	1,26
8	- 0,017	- 0,043	- 0,030	- 0,000	+ 0,018	+ 0,095	- 0,027	+ 0,042	+ 0,015	- 0,004	+ 0,005	0,041	0,38
9	- 0,015	- 0,033	- 0,016	- 0,024	- 0,048	- 0,071	- 0,012	- 0,051	- 0,039	- 0,046	- 0,036	0,019	5,91
10	- 0,020	- 0,016	- 0,031	- 0,052	- 0,037	- 0,052	- 0,052	- 0,008	- 0,048	- 0,031	- 0,035	0,016	6,70
11	+ 0,170	+ 0,179	+ 0,104	+ 0,073	+ 0,168	+ 0,043	+ 0,093	+ 0,027	+ 0,067	+ 0,079	+ 0,100	0,055	5,80
12	+ 0,035	+ 0,035	+ 0,030	+ 0,034	+ 0,039	+ 0,066	+ 0,074	- 0,016	+ 0,102	+ 0,085	+ 0,048	0,034	4,52
d	- 0,001	- 0,000	+ 0,000	- 0,002	- 0,002	+ 0,001	+ 0,001	- 0,002	+ 0,000	- 0,002	+ 0,004	0,052	
Sd	0,038	0,041	0,049	0,045	0,035	0,052	0,050	0,045	0,056	0,055	0,047		

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

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

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

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+0,51	+0,62	+0,09	+0,30	+0,12	-0,06	+0,22	+0,48	+0,24	+0,43
2	-0,26	-0,02	-0,01	-0,16	+0,09	-0,53	-0,14	+0,04	-0,15	-0,57
3	-1,10	-1,62	-2,05	-2,24	-2,05	-1,25	-1,54	-2,16	-1,03	-0,62
4	-1,91	-0,71	-0,50	-0,16	+0,22	+0,06	-0,95	-1,26	-1,76	-2,03
5	+1,59	+1,57	+0,79	+0,73	+0,49	+0,47	+0,40	+0,69	+0,20	+0,41
6	+0,68	+0,65	+0,34	+0,61	+0,72	+0,39	+0,71	+0,95	+0,77	+0,59
7	+0,62	+0,94	+0,23	-0,36	+0,71	-0,43	-0,02	+0,73	+0,05	-0,18
8	-0,44	-1,07	-0,60	-0,01	+0,51	+1,83	-0,53	+0,93	+0,28	-0,07
9	-0,39	-0,82	-0,33	-0,54	-1,38	-1,38	-0,24	-1,12	-0,70	-0,83
10	-0,52	-0,39	-0,62	-1,16	-1,05	-1,01	-1,04	-0,18	-0,87	-0,57
11	+4,45	+4,41	+2,13	+1,61	+4,81	+0,82	+1,84	+0,59	+1,20	+1,43
12	+0,92	+0,86	+0,61	+0,76	+1,11	+1,28	+1,48	-0,36	+1,83	+1,54

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

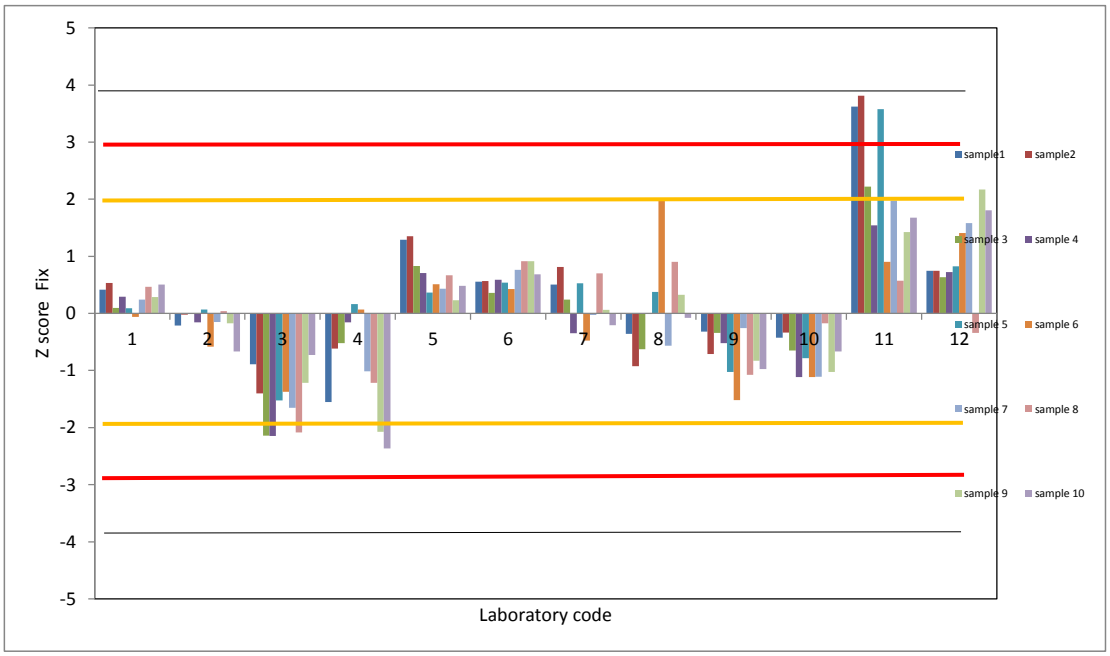
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+0,42	+0,53	+0,09	+0,29	+0,09	-0,06	+0,24	+0,47	+0,29	+0,51
2	-0,21	-0,02	-0,01	-0,16	+0,07	-0,58	-0,15	+0,04	-0,17	-0,66
3	-0,89	-1,40	-2,14	-2,15	-1,53	-1,37	-1,65	-2,09	-1,21	-0,73
4	-1,55	-0,62	-0,52	-0,16	+0,16	+0,06	-1,01	-1,22	-2,08	-2,37
5	+1,29	+1,35	+0,83	+0,70	+0,37	+0,51	+0,43	+0,67	+0,23	+0,48
6	+0,56	+0,57	+0,36	+0,59	+0,54	+0,43	+0,76	+0,91	+0,91	+0,69
7	+0,50	+0,81	+0,24	-0,35	+0,53	-0,48	-0,03	+0,70	+0,06	-0,21
8	-0,36	-0,92	-0,63	-0,01	+0,38	+2,01	-0,57	+0,90	+0,33	-0,08
9	-0,32	-0,71	-0,34	-0,52	-1,03	-1,52	-0,26	-1,08	-0,83	-0,97
10	-0,42	-0,34	-0,65	-1,11	-0,78	-1,12	-1,11	-0,17	-1,02	-0,66
11	+3,62	+3,81	+2,22	+1,54	+3,58	+0,91	+1,97	+0,57	+1,42	+1,68
12	+0,75	+0,75	+0,64	+0,73	+0,82	+1,41	+1,58	-0,34	+2,17	+1,80

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



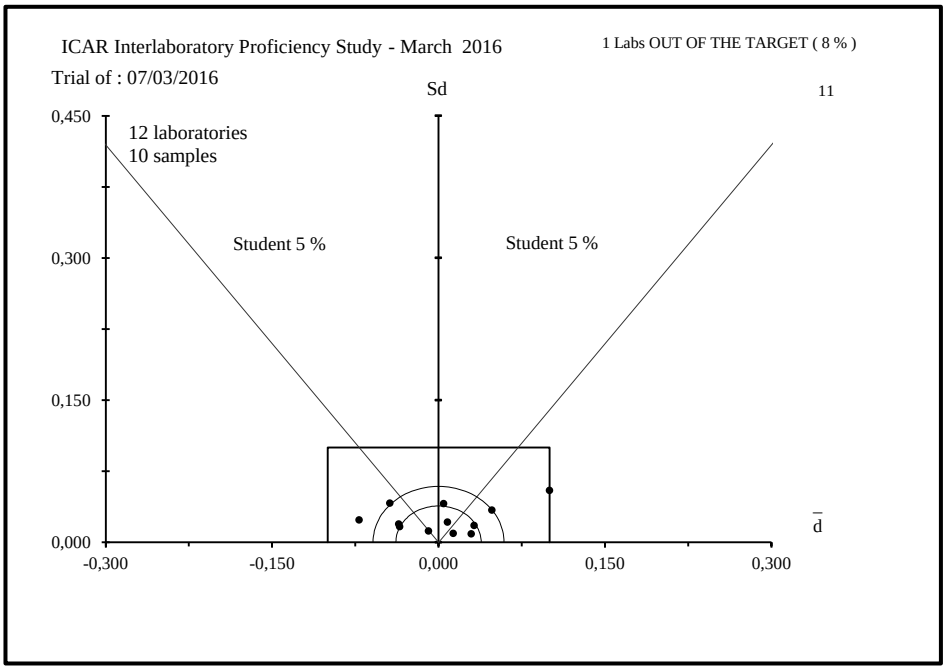


Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST
RAW MILK
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March 2016

Name	City	Country
AIA-LAB. STANDARD LATTE	MACARESE (ROMA)	ITALY
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
ESTONIAN LIVESTOCK PERFORMANCE RECORDING LTD	TARTU	ESTONIA
ILVO - T.V.	MELLE	BELGIUM
JAPAN DAIRY TECHNICAL ASSOCIATION	TOKYO	JAPAN
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LACTOLAB	IRENE	SOUTH AFRICA
LOM KCHZ LABORATORIM REFERENCYJNE	PRUSZKOW	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
QLIP N.V.	CM ZUTPHEN	NETHERLAND
TEAGASC FOOD RESEARCH CENTER	FERMOY CO-CORK	IRELAND
VALACTA	STE ANNE DE BELLEVUE	CANADA

ICAR
PROFICIENCY TESTING SCHEME

March 2016

Raw Milk

Determination of UREA CONTENT

Sending date of statistical treatment : 19th april 2016

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)	
Contact :	Gavin Scott	gavin@milktest.co.nz
ICAR Staff	Silvia Orlandini	pt@icar.org silvia@icar.org

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

Nb	%	N°	d	Sd	D	**Method**
1	9	3	- 0,10	0,50	0,51	ChemSpec
2	18	7	- 0,40	0,33	0,52	enzymatic
3	27	9	- 0,30	0,45	0,54	diff.pH
4	36	11	- 0,31	0,65	0,72	diff.pH
5	45	8	+ 0,32	0,83	0,89	diff.pH
6	55	1	- 0,59	0,92	1,09	diff.pH
7	64	10	- 0,92	0,79	1,21	Continuous flow
8	73	2	+ 0,89	1,54	1,78	diff.pH
9	82	6	+ 1,59	0,85	1,81	Continuous flow
10	91	5	- 1,89	1,06	2,17	diff.pH
11	100	4	+ 1,96	1,24	2,32	diff.pH

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 7 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}	0,39
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	1,32

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	0,00	0,21	0,21	0,21	0,00	0,21	0,00	0,21	0,21	0,21	0,13	20
2	0,10	0,00	0,20	0,30	0,30	1,00	0,00	1,90 *	0,50	0,00	0,50	20
3	0,30	0,20	0,00	0,20	0,10	0,30	0,10	0,30	0,30	0,10	0,15	20
4	0,50	1,70	0,10	0,40	0,40	0,00	0,10	0,70	0,80	0,00	0,48	20
5	0,20	0,10	0,40	0,00	0,20	0,40	0,50	0,30	0,80	0,50	0,29	20
6	0,10	0,40	0,70	0,50	2,00	1,30	0,60	0,40	0,30	1,00 *	0,64	20
7	0,10	0,20	0,00	0,40	1,10	1,00	0,70	0,20	0,50	0,30	0,41	20
8	0,00	0,90	0,30	0,20	0,40	0,40	0,80	0,70	0,10	0,10	0,35	20
9	0,10	0,20	0,60	0,20	1,10	0,20	0,70	0,20	0,60	0,40	0,37	20
10	0,29	1,07	0,58	0,10	0,39	0,78	0,19	0,19	0,10	0,19	0,35	20
11	0,00	0,00	0,30	0,50	1,10	1,00	0,40	0,90	1,40	0,30	0,53	20
Sr	0,15	0,49	0,27	0,22	0,61	0,51	0,33	0,52	0,44	0,28		220
NE	22	22	22	22	22	22	22	22	22	22		
L	0,54	1,72	0,96	0,79	2,17	1,82	1,18	1,18	1,57	0,65		

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	19,47	42,48	29,00	33,49	36,17	45,48	23,97	50,40	54,68	60,88
2	19,45	42,00	28,90	33,15	38,25	48,30	25,10	57,15	56,95	61,60
3	17,85	42,50	28,60	33,00	37,25	47,45	24,15	52,15	56,65	61,35
4	19,45	43,05	29,95	34,40	39,40	49,90	25,35	54,75	60,30	65,00
5	18,70	41,25	27,80	31,70	35,80	44,90	22,85	48,75	53,50	57,75
6	20,55	45,80 *	30,85	34,95	39,10	47,85	25,20	53,70	57,35	62,50
7	18,65	42,00	27,80	32,80	37,15	47,20	23,55	51,60	56,05	61,15
8	18,50	42,05	29,45	34,10	38,20	48,30	23,80	50,95	57,95	61,85
9	18,35	41,30	28,70	32,60	37,95	46,80	23,85	51,50	56,00	61,90
10	17,14	40,15	27,57	32,57	37,18	46,41	22,72	50,97	56,75	61,26
11	20,10	42,30	28,85	32,45	37,45	46,90	24,20	51,15	55,20	60,25
M	18,93	41,91	28,86	33,20	37,63	47,23	24,07	52,10	56,49	61,41
REF.	19,15	42,06	28,96	33,13	37,60	47,23	24,16	52,01	56,34	61,30
SD	0,99	0,82	0,98	0,96	1,10	1,39	0,88	2,31	1,79	1,72

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 7 laboratories using the reference method ISO 14637 / IDF 195, after outliers discarging using Grubbs test 5% risk level

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran								2		6
Outlier Grubbs		6								
sr	0,15	0,50	0,27	0,22	0,61	0,51	0,33	0,34	0,44	0,19
SR	1,00	0,89	0,99	0,97	1,19	1,44	0,91	1,69	1,82	1,78

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	+ 0,33	+ 0,42	+ 0,04	+ 0,36	- 1,44	- 1,75	- 0,19	- 1,61	- 1,66	- 0,41	- 0,59	0,92	2,04
2	+ 0,30	- 0,06	- 0,06	+ 0,02	+ 0,65	+ 1,08	+ 0,94	+ 5,14	+ 0,61	+ 0,30	+ 0,89	1,54	1,83
3	- 1,30	+ 0,44	- 0,36	- 0,13	- 0,35	+ 0,23	- 0,01	+ 0,14	+ 0,31	+ 0,05	- 0,10	0,50	0,62
4	+ 0,30	+ 0,99	+ 0,99	+ 1,27	+ 1,80	+ 2,68	+ 1,19	+ 2,74	+ 3,96	+ 3,70	+ 1,96	1,24	5,00
5	- 0,45	- 0,81	- 1,16	- 1,43	- 1,80	- 2,33	- 1,31	- 3,26	- 2,84	- 3,55	- 1,89	1,06	5,66
6	+ 1,40	+ 3,74	+ 1,89	+ 1,82	+ 1,50	+ 0,63	+ 1,04	+ 1,69	+ 1,01	+ 1,20	+ 1,59	0,85	5,91
7	- 0,50	- 0,06	- 1,16	- 0,33	- 0,45	- 0,02	- 0,61	- 0,41	- 0,29	- 0,15	- 0,40	0,33	3,83
8	- 0,65	- 0,01	+ 0,49	+ 0,97	+ 0,60	+ 1,08	- 0,36	- 1,06	+ 1,61	+ 0,55	+ 0,32	0,83	1,22
9	- 0,80	- 0,76	- 0,26	- 0,53	+ 0,35	- 0,43	- 0,31	- 0,51	- 0,34	+ 0,60	- 0,30	0,45	2,10
10	- 2,01	- 1,92	- 1,39	- 0,55	- 0,42	- 0,82	- 1,44	- 1,04	+ 0,41	- 0,03	- 0,92	0,79	3,68
11	+ 0,95	+ 0,24	- 0,11	- 0,68	- 0,15	- 0,33	+ 0,04	- 0,86	- 1,14	- 1,05	- 0,31	0,65	1,51
d	- 0,22	- 0,15	- 0,10	+ 0,07	+ 0,03	+ 0,00	- 0,09	+ 0,09	+ 0,15	+ 0,11	+ 0,02	1,37	
Sd	0,99	0,82	0,98	0,96	1,10	1,39	0,88	2,31	1,79	1,72	1,38		

d = mean of differences Sd = 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	+0,33	+0,51	+0,04	+0,38	-1,30	-1,26	-0,22	-0,70	-0,93	-0,24
2	+0,31	-0,07	-0,06	+0,02	+0,59	+0,77	+1,07	+2,23	+0,34	+0,18
3	-1,30	+0,53	-0,37	-0,13	-0,32	+0,16	-0,01	+0,06	+0,17	+0,03
4	+0,31	+1,20	+1,02	+1,33	+1,63	+1,92	+1,35	+1,19	+2,21	+2,15
5	-0,45	-0,99	-1,19	-1,49	-1,63	-1,67	-1,49	-1,41	-1,59	-2,06
6	+1,41	+4,55	+1,94	+1,90	+1,36	+0,45	+1,18	+0,73	+0,57	+0,70
7	-0,50	-0,07	-1,19	-0,34	-0,41	-0,02	-0,69	-0,18	-0,16	-0,09
8	-0,65	-0,01	+0,50	+1,02	+0,54	+0,77	-0,41	-0,46	+0,90	+0,32
9	-0,80	-0,93	-0,27	-0,55	+0,31	-0,31	-0,35	-0,22	-0,19	+0,35
10	-2,02	-2,33	-1,42	-0,58	-0,38	-0,59	-1,64	-0,45	+0,23	-0,02
11	+0,96	+0,29	-0,11	-0,71	-0,14	-0,23	+0,05	-0,37	-0,64	-0,61

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

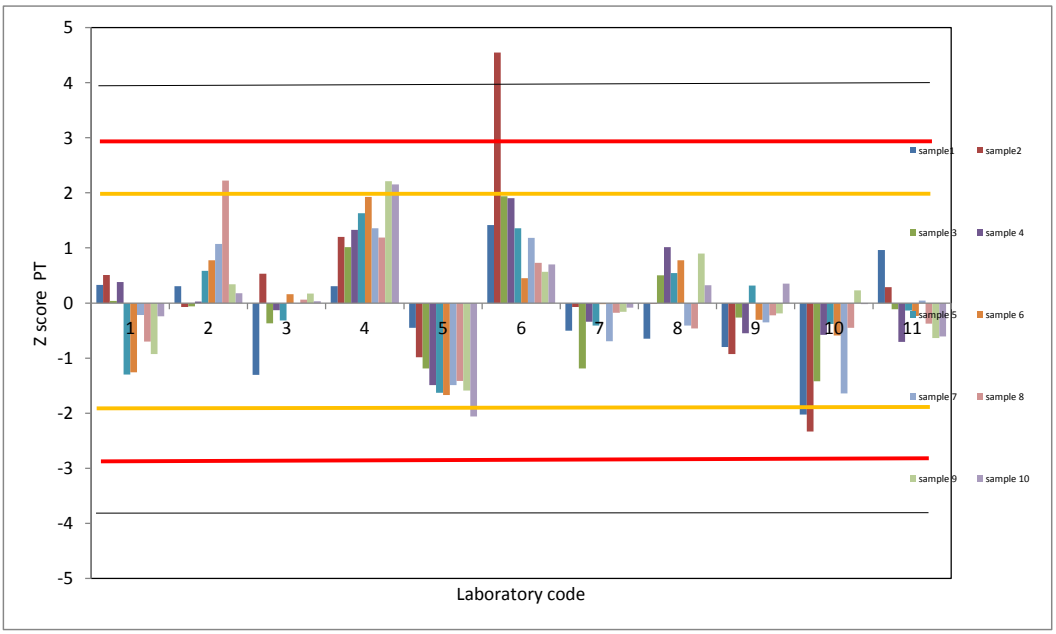


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

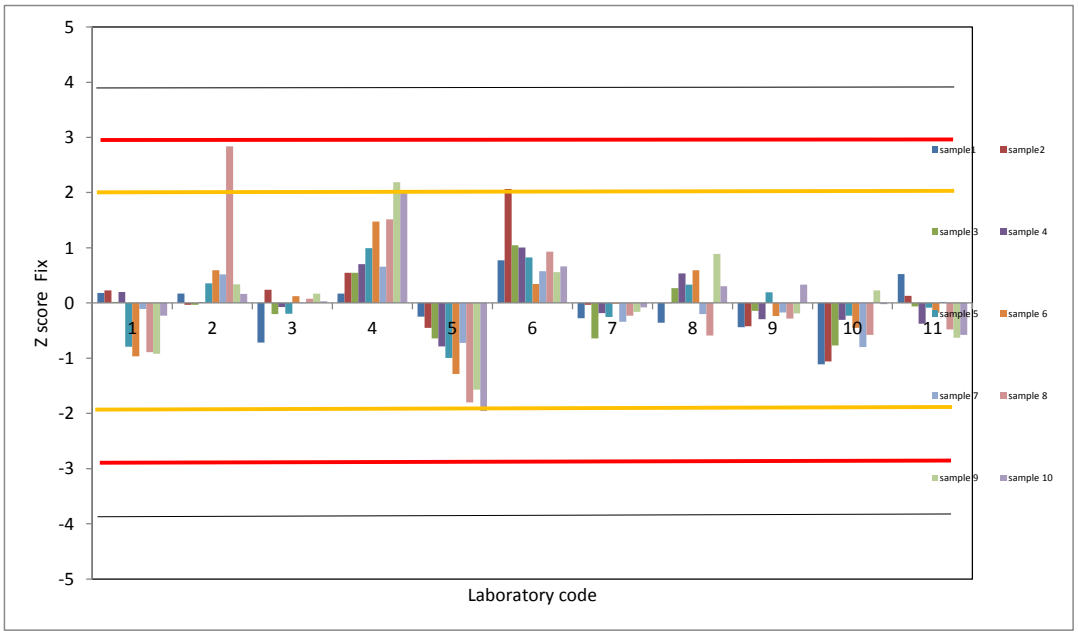
Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+0,18	+0,23	+0,02	+0,20	-0,79	-0,97	-0,11	-0,89	-0,92	-0,23
2	+0,17	-0,03	-0,03	+0,01	+0,36	+0,59	+0,52	+2,84	+0,34	+0,17
3	-0,72	+0,24	-0,20	-0,07	-0,19	+0,12	-0,01	+0,08	+0,17	+0,03
4	+0,17	+0,55	+0,55	+0,70	+0,99	+1,48	+0,66	+1,51	+2,19	+2,05
5	-0,25	-0,45	-0,64	-0,79	-1,00	-1,28	-0,72	-1,80	-1,57	-1,96
6	+0,78	+2,07	+1,04	+1,01	+0,83	+0,35	+0,57	+0,93	+0,56	+0,66
7	-0,27	-0,03	-0,64	-0,18	-0,25	-0,01	-0,34	-0,23	-0,16	-0,08
8	-0,36	-0,01	+0,27	+0,54	+0,33	+0,59	-0,20	-0,59	+0,89	+0,31
9	-0,44	-0,42	-0,14	-0,29	+0,19	-0,23	-0,17	-0,28	-0,19	+0,33
10	-1,11	-1,06	-0,77	-0,31	-0,23	-0,45	-0,80	-0,57	+0,23	-0,02
11	+0,53	+0,13	-0,06	-0,37	-0,08	-0,18	+0,02	-0,48	-0,63	-0,58

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



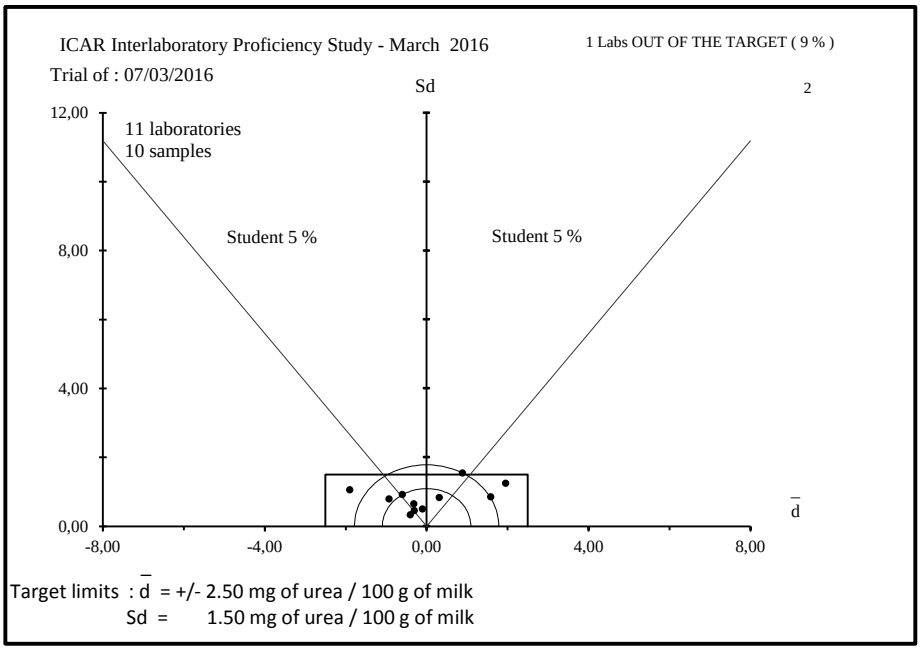


Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST
RAW MILK
UREA CONTENT
March 2016

Name	City	Country
ACTALIA-Cecalait	POLIGNY	FRANCE
AIA-LAB. STANDARD LATTE	MACARESE (ROMA)	ITALY
CENTRAL MILK LABORATORY - ICBA	CAESAREA	ISRAEL
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
EASTERN LAB SERVICES	MEDINA	USA
ESTONIAN LIVESTOCK PERFORMANCE RECORDING LTD	TARTU	ESTONIA
LOM KCHZ LABORATORIM REFERENCYJNE	PRUSZKOW	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
QLIP N.V.	CM ZUTPHEN	NETHERLAND
VALACTA	STE ANNE DE BELLEVUE	CANADA

ICAR
PROFICIENCY TESTING SCHEME

March 2016

Raw Milk

Enumeration of SOMATIC CELLS

Sending date of statistical treatment : 19th april 2016

Frame of activity :	ICAR Milk Analyses Sub Committee (MA SC)		
Contact :	Gavin Scott	gavin@milktest.co.nz	
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: 10^3 cells / ml

Nb	%	N°	d	Sd	D	Method
1	4	12	+ 8	11	13	B
2	7	10	+ 10	15	18	B
3	11	14	- 2	28	28	B
4	15	4	- 15	38	41	B
5	19	1	- 39	31	50	A
6	22	2	- 41	32	52	B
7	26	16	+ 42	32	53	B
8	30	9	+ 42	34	54	B
9	33	24	- 38	38	54	NC
10	37	5	+ 43	36	56	B
11	41	20	- 45	35	57	B
12	44	19	- 43	39	58	B
13	48	11	+ 48	39	62	B
14	52	18	- 37	51	63	B
15	56	17	- 53	45	69	B
16	59	8	+ 53	47	71	B
17	63	13	+ 54	47	72	B
18	67	21	+ 54	48	72	B
19	70	25	- 56	47	73	B
20	74	26	+ 47	61	77	A
21	78	15	+ 65	47	80	A
22	81	7	- 62	55	83	B
23	85	27	+ 66	64	92	B
24	89	22	+ 75	61	97	B
25	93	23	- 81	58	100	B
26	96	3	- 115	105	156	B
27	100	6	- 60	164	174	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 :

+/- 35.10 ^{3} cells / ml for $\bar{d}$ and 35.10 ^{3} cells / ml for Sd

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 27 laboratories using reference metod ISO 133666-1 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}	14	2%
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	76	13%

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	15	30	10	10	0	20	30	0	5	5	12	20
2	13	22	7	105 *	1	5	13	2	5	5	24	20
3	18	25	19	5	1	88	3	12	7	0	22	20
4	3	7	1	1	5	4	4	17	2	5	5	20
5	23	1	21	9	2	22	20	19	4	11	11	20
6	78	50	25	31	18	26	15	38	3	1	25	20
7	8	3	7	29	5	31	16	20	0	3	11	20
8	12	6	13	8	17	26	20	29	13	9	12	20
9	55	16	10	11	17	6	5	1	4	2	14	20
10	1	55	3	14	3	5	22	14	9	2	14	20
11	14	38	37	3	9	79	24	9	2	15	23	20
12	7	28	12	15	16	72	38	3	4	12	20	20
13	18	21	19	17	3	18	7	51	5	17	15	20
14	25	4	3	17	2	9	27	3	3	4	9	20
15	10	22	6	7	3	7	17	1	1	0	7	20
16	8	18	2	3	4	6	31	9	2	1	9	20
17	5	20	1	18	8	20	8	7	1	6	8	20
18	33	11	6	9	1	1	9	33	2	11	11	20
19	37	44	17	23	8	17	1	6	5	4	15	20
20	5	6	7	12	22	0	7	3	9	10	7	20
21	7	35	14	12	23	19	26	47	1	3	16	20
22	80	26	26	4	4	10	6	0	6	9	20	20
23	13	6	2	**	**	3	0	1	1	**	4	14
24	3	27	20	3	2	15	2	6	2	2	8	20
25	22	26	5	1	4	56	3	10	0	4	15	20
26	28	28	7	4	5	42	32	5	2	4	15	20
27	10	14	1	10	8	4	9	4	4	1	5	20
Sr	20	18	10	17	7	23	13	14	3	5		534
r	126	126	42	50	42	126	63	63	25	25		
NE	54	54	54	52	52	54	54	54	54	52		
L	84	76	42	39	29	96	53	56	14	21		

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	893	1085	245	355	170	1280	655	500	48	83
2	892	1089	249	308	171	1288	662	503	48	83
3	769	924	227	328	149	1054	557	435	38	71
4	882	1083	291	395	194	1329	707	500	62	108
5	1057	1224	296	423	196	1481	748	562	47	98
6	675	812	196	316	140	1619	781	474	18 *	74
7	872	1029	251	347	158	1201	630	465	43	83
8	1067	1267	304	418	196	1502	770	559	55	91
9	1040	1237	293	416	183	1451	781	572	49	97
10	1006	1164	280	406	175	1376	716	543	49	88
11	1038	1249	313	417	191	1498	755	573	53	97
12	971	1165	275	394	184	1410	704	534	46	96
13	1077	1281	301	419	198	1489	761	571	55	94
14	966	1134	287	385	175	1333	718	538	98 *	45 *
15	1083	1259	307	429	212	1527	779	587	63	102
16	1034	1242	296	425	194	1466	744	567	56	100
17	858	1068	256	364	155	1244	633	464	44	85
18	886	1079	264	370	169	1230	667	486	53	125
19	874	1090	255	358	160	1253	650	500	47	81
20	904	1103	255	360	159	1266	623	460	46	79
21	1084	1266	277	428	197	1489	778	576	56	95
22	1084	1278	289	457	204	1565	811	609	61	93
23	874	1028	226			1196	627	483	45	
24	892	1080	278	339	164	1265	678	480	54	85
25	891	1036	246	357	161	1238	617	463	43	87
26	1113	1263	283	352	189	1505	744	556	49	117
27	1090	1299	301	425	195	1552	789	574	47	92
M	958	1142	272	384	178	1374	707	523	50	92
REF.	963	1150	273	384	178	1377	708	523	50	91
SD	112	121	29	40	19	143	68	49	6	12

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

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran				2						
Outlier Grubbs									6;14	14
sr	20	18	10	10	7	23	13	14	3	5
SR	113	122	30	39	20	144	68	50	7	13
sr %	2%	2%	4%	2%	4%	2%	2%	3%	7%	6%
SR %	12%	11%	11%	10%	11%	10%	10%	10%	14%	14%

Table V : **ACCURACY - differences (laboratory - reference) in 10^3 cells / ml**

Sample / Lab Code	1	2	3	4	5	6	7	8	9	10	d	Sd_{lab}	t
1	- 71	- 65	- 28	- 29	- 8	- 97	- 53	- 23	- 2	- 8	- 39	31	3,87
2	- 72	- 61	- 25	- 77	- 8	- 90	- 47	- 20	- 2	- 8	- 41	32	4,01
3	- 194	- 226	- 47	- 57	- 30	- 323	- 152	- 88	- 12	- 20	- 115	105	3,47
4	- 82	- 67	+ 17	+ 10	+ 15	- 48	- 1	- 24	+ 12	+ 17	- 15	38	1,26
5	+ 93	+ 74	+ 22	+ 38	+ 18	+ 104	+ 40	+ 38	- 3	+ 7	+ 43	36	3,77
6	- 288	- 338	- 78	- 69	- 38	+ 242	+ 72	- 49	- 32	- 17	- 60	164	1,15
7	- 91	- 121	- 23	- 38	- 21	- 177	- 78	- 58	- 7	- 8	- 62	55	3,56
8	+ 104	+ 117	+ 30	+ 34	+ 17	+ 125	+ 62	+ 35	+ 5	- 0	+ 53	47	3,58
9	+ 76	+ 87	+ 20	+ 31	+ 4	+ 74	+ 72	+ 48	- 1	+ 6	+ 42	34	3,90
10	+ 42	+ 14	+ 6	+ 22	- 4	- 2	+ 8	+ 20	- 1	- 3	+ 10	15	2,20
11	+ 75	+ 99	+ 39	+ 32	+ 12	+ 120	+ 47	+ 49	+ 3	+ 6	+ 48	39	3,87
12	+ 7	+ 15	+ 2	+ 9	+ 6	+ 33	- 4	+ 10	- 4	+ 5	+ 8	11	2,36
13	+ 114	+ 131	+ 27	+ 34	+ 19	+ 112	+ 52	+ 47	+ 5	+ 3	+ 54	47	3,62
14	+ 2	- 16	+ 13	+ 0	- 3	- 45	+ 9	+ 14	+ 48	- 46	- 2	28	0,25
15	+ 120	+ 109	+ 34	+ 44	+ 33	+ 149	+ 70	+ 63	+ 13	+ 11	+ 65	47	4,32
16	+ 71	+ 92	+ 23	+ 40	+ 16	+ 89	+ 35	+ 43	+ 6	+ 9	+ 42	32	4,22
17	- 106	- 82	- 18	- 20	- 23	- 133	- 75	- 60	- 6	- 6	- 53	45	3,73
18	- 78	- 71	- 9	- 15	- 10	- 148	- 42	- 38	+ 3	+ 34	- 37	51	2,30
19	- 90	- 60	- 19	- 27	- 18	- 125	- 59	- 23	- 3	- 10	- 43	39	3,49
20	- 60	- 47	- 19	- 24	- 19	- 111	- 86	- 64	- 4	- 12	- 45	35	4,01
21	+ 120	+ 116	+ 4	+ 44	+ 18	+ 111	+ 70	+ 52	+ 6	+ 4	+ 54	48	3,60
22	+ 121	+ 128	+ 16	+ 73	+ 26	+ 188	+ 103	+ 86	+ 11	+ 2	+ 75	61	3,87
23	- 90	- 122	- 47			- 182	- 81	- 41	- 5		- 81	58	3,68
24	- 72	- 70	+ 5	- 46	- 14	- 113	- 30	- 43	+ 4	- 6	- 38	38	3,19
25	- 72	- 114	- 28	- 28	- 17	- 139	- 92	- 60	- 7	- 4	- 56	47	3,76
26	+ 150	+ 113	+ 9	- 32	+ 10	+ 128	+ 36	+ 32	- 1	+ 26	+ 47	61	2,44
27	+ 127	+ 149	+ 27	+ 41	+ 17	+ 175	+ 80	+ 51	- 3	+ 1	+ 66	64	3,30
d	- 5	- 8	- 2	- 0	- 0	- 3	- 2	- 0	+ 0	+ 1	- 2	75	
Sd	112	121	29	40	19	143	68	49	6	12	76		

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

Upper limits : $\bar{d}$ = +/- 35.10 ^{3} cells / ml Sd = 35.10 ^{3} cells / ml

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	-0,63	-0,53	-0,98	-0,72	-0,44	-0,68	-0,79	-0,48	-0,37	-0,69
2	-0,64	-0,50	-0,85	-1,90	-0,42	-0,63	-0,69	-0,42	-0,37	-0,69
3	-1,74	-1,87	-1,62	-1,40	-1,58	-2,26	-2,25	-1,81	-1,94	-1,62
4	-0,73	-0,55	+0,60	+0,26	+0,80	-0,34	-0,02	-0,49	+1,91	+1,34
5	+0,84	+0,61	+0,78	+0,95	+0,93	+0,73	+0,59	+0,78	-0,45	+0,53
6	-2,58	-2,79	-2,70	-1,70	-2,03	+1,69	+1,07	-1,01	-5,08	-1,42
7	-0,81	-1,00	-0,79	-0,93	-1,10	-1,23	-1,16	-1,19	-1,08	-0,69
8	+0,93	+0,97	+1,06	+0,84	+0,91	+0,87	+0,92	+0,72	+0,73	-0,04
9	+0,68	+0,72	+0,69	+0,77	+0,22	+0,52	+1,07	+0,99	-0,13	+0,49
10	+0,38	+0,11	+0,22	+0,54	-0,21	-0,01	+0,12	+0,40	-0,21	-0,24
11	+0,67	+0,82	+1,37	+0,80	+0,64	+0,84	+0,69	+1,01	+0,49	+0,45
12	+0,07	+0,13	+0,07	+0,23	+0,30	+0,23	-0,06	+0,21	-0,61	+0,40
13	+1,02	+1,08	+0,95	+0,85	+1,01	+0,78	+0,78	+0,97	+0,73	+0,20
14	+0,02	-0,13	+0,46	+0,01	-0,18	-0,31	+0,14	+0,29	+7,49	-3,72
15	+1,07	+0,90	+1,18	+1,10	+1,75	+1,04	+1,04	+1,30	+1,99	+0,89
16	+0,63	+0,76	+0,79	+1,00	+0,83	+0,62	+0,52	+0,89	+0,97	+0,69
17	-0,94	-0,67	-0,61	-0,50	-1,24	-0,93	-1,11	-1,23	-1,00	-0,49
18	-0,69	-0,59	-0,32	-0,36	-0,52	-1,03	-0,62	-0,77	+0,49	+2,71
19	-0,80	-0,49	-0,65	-0,66	-0,97	-0,87	-0,87	-0,48	-0,53	-0,81
20	-0,53	-0,39	-0,65	-0,60	-1,03	-0,78	-1,27	-1,31	-0,68	-0,97
21	+1,08	+0,96	+0,14	+1,08	+0,96	+0,78	+1,03	+1,07	+0,89	+0,28
22	+1,08	+1,06	+0,55	+1,80	+1,36	+1,31	+1,52	+1,76	+1,75	+0,12
23	-0,80	-1,01	-1,64			-1,27	-1,20	-0,84	-0,84	
24	-0,64	-0,58	+0,17	-1,13	-0,76	-0,79	-0,45	-0,89	+0,65	-0,49
25	-0,64	-0,94	-0,96	-0,68	-0,92	-0,97	-1,36	-1,24	-1,08	-0,32
26	+1,34	+0,94	+0,33	-0,80	+0,54	+0,89	+0,53	+0,66	-0,13	+2,10
27	+1,13	+1,23	+0,95	+1,01	+0,88	+1,22	+1,19	+1,04	-0,45	+0,04

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

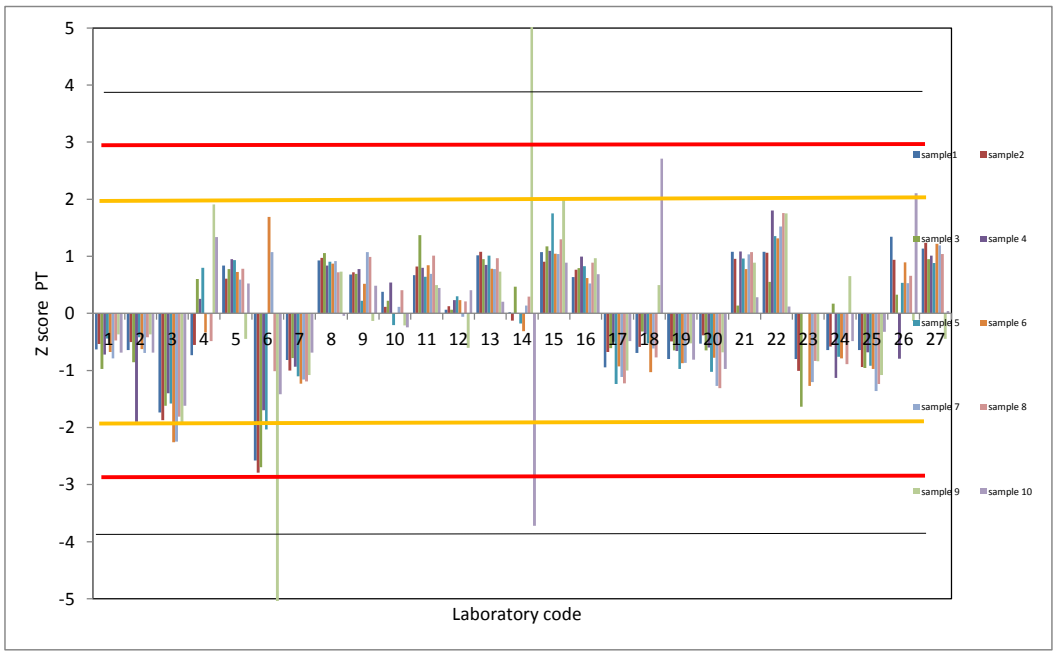


Table VII : **Zscore of the different laboratories for each sample.**

ZS calculated on the standard deviation of reproducibility of the method

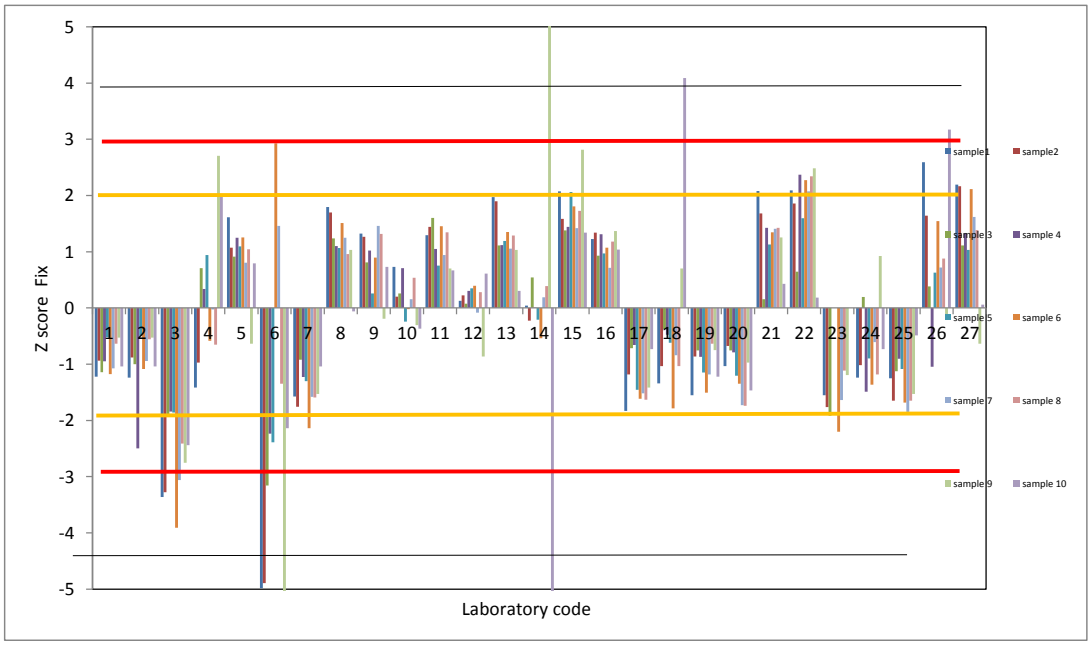
Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-1,22	-0,94	-1,14	-0,95	-0,52	-1,18	-1,07	-0,64	-0,53	-1,04
2	-1,24	-0,88	-1,00	-2,49	-0,49	-1,08	-0,94	-0,55	-0,53	-1,04
3	-3,36	-3,28	-1,90	-1,84	-1,86	-3,91	-3,06	-2,41	-2,75	-2,44
4	-1,41	-0,97	+0,71	+0,34	+0,94	-0,58	-0,02	-0,65	+2,71	+2,01
5	+1,62	+1,07	+0,91	+1,25	+1,10	+1,26	+0,80	+1,04	-0,64	+0,79
6	-4,99	-4,90	-3,16	-2,23	-2,39	+2,93	+1,46	-1,35	-7,21	-2,14
7	-1,58	-1,76	-0,92	-1,23	-1,30	-2,14	-1,58	-1,59	-1,53	-1,04
8	+1,80	+1,70	+1,24	+1,10	+1,07	+1,51	+1,25	+0,96	+1,03	-0,06
9	+1,32	+1,27	+0,81	+1,02	+0,26	+0,89	+1,46	+1,32	-0,19	+0,73
10	+0,73	+0,20	+0,26	+0,71	-0,24	-0,02	+0,16	+0,54	-0,30	-0,37
11	+1,30	+1,44	+1,60	+1,05	+0,76	+1,46	+0,94	+1,34	+0,70	+0,67
12	+0,13	+0,22	+0,08	+0,30	+0,35	+0,40	-0,08	+0,28	-0,86	+0,61
13	+1,97	+1,90	+1,11	+1,12	+1,19	+1,35	+1,06	+1,29	+1,03	+0,31
14	+0,04	-0,23	+0,54	+0,01	-0,21	-0,54	+0,19	+0,39	+10,62	-5,62
15	+2,07	+1,59	+1,38	+1,44	+2,06	+1,81	+1,42	+1,73	+2,82	+1,34
16	+1,23	+1,34	+0,93	+1,31	+0,97	+1,08	+0,71	+1,18	+1,37	+1,04
17	-1,83	-1,18	-0,72	-0,66	-1,46	-1,61	-1,52	-1,63	-1,42	-0,73
18	-1,34	-1,03	-0,37	-0,48	-0,62	-1,79	-0,84	-1,03	+0,70	+4,09
19	-1,55	-0,86	-0,76	-0,87	-1,14	-1,51	-1,18	-0,64	-0,75	-1,22
20	-1,03	-0,68	-0,76	-0,79	-1,21	-1,35	-1,73	-1,74	-0,97	-1,47
21	+2,08	+1,68	+0,16	+1,43	+1,13	+1,35	+1,41	+1,43	+1,26	+0,43
22	+2,09	+1,86	+0,65	+2,37	+1,60	+2,27	+2,07	+2,34	+2,48	+0,18
23	-1,55	-1,76	-1,92			-2,20	-1,64	-1,11	-1,19	
24	-1,24	-1,02	+0,20	-1,49	-0,90	-1,36	-0,61	-1,18	+0,92	-0,73
25	-1,25	-1,65	-1,12	-0,90	-1,08	-1,68	-1,85	-1,65	-1,53	-0,49
26	+2,59	+1,64	+0,38	-1,05	+0,63	+1,55	+0,72	+0,88	-0,19	+3,17
27	+2,20	+2,17	+1,11	+1,33	+1,04	+2,12	+1,62	+1,38	-0,64	+0,06

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



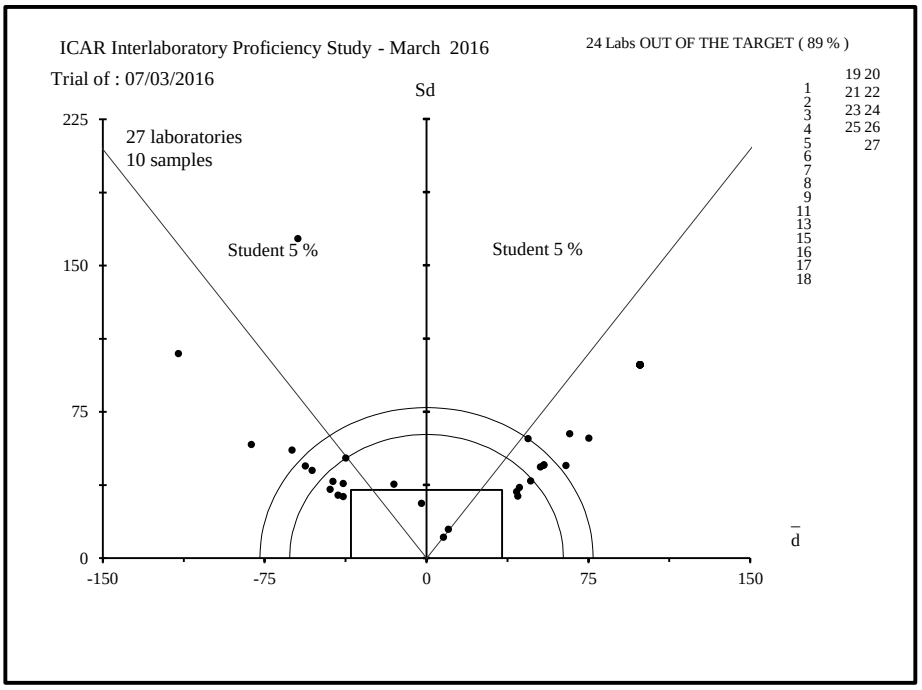


Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST

RAW MILK

Enumeration of SOMATIC CELLS FRANCE
March 2016

Name	City	Country
ACTALIA-Cecalait	POLIGNY	FRANCE
ALLATTENYESZTESI TELJESITMENYVIZSGALO KFT	GODOLLO	HUNGARY
CENTRAL MILK LABORATORY - ICBA	CAESAREA	ISRAEL
EASTERN LAB SERVICES	MEDINA	USA
ESTONIAN LIVESTOCK PERFORMANCE RECORDING LTD	TARTU	ESTONIA
FEDERAZIONE LATTERIE ALTO ADIGE	BOLZANO	ITALY
LAB. AGROALIMENTARIO DE SANTANDER	SANTANDER	SPAIN
LACTOLAB	IRENE	SOUTH AFRICA
LOM KCHZ LABORATORIM REFERENCYJNE	PRUSZKOW	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
P.F.H.B. PROD. MLEKA - KOBIERNO	KOBIERNO	POLAND
P.F.H.B. PROD. MLEKA - MINIKOWO	MINIKOWO	POLAND
P.F.H.B. PROD. MLEKA - PRUSZKOW	PRUSZKOW	POLAND
P.F.H.B. PROD. MLEKA - TYKOCIN	TYKOCIN	POLAND
QLIP N.V.	CM ZUTPHEN	NETHERLAND
SUISSE LAB AG	ZOLLIKOFEN	SWITZERLAND
THE CATTLE INFORMATION SERVICE	TELFORD	UNITED KINGDOM
UNIVERZITET U NOVOM SADU	NOVI SAD	SERBIA
VALACTA	STE ANNE DE BELLEVUE	CANADA