THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

FRAME OF ACTIVITY : ICAR MILK ANALYSES SUB-COMMITTEE (MA SC)

ICAR - Proficiency Testing Scheme
Raw cow milk

Chemical “Reference” Methods

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

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1.Introduction

Dear Participant,

Thank you for participating in the ICAR Proficiency Test (PT) March 2017 !

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 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.

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

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 E 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 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 MASC 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.

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 have been updated with data of the previous ICAR PT if you have participated.

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

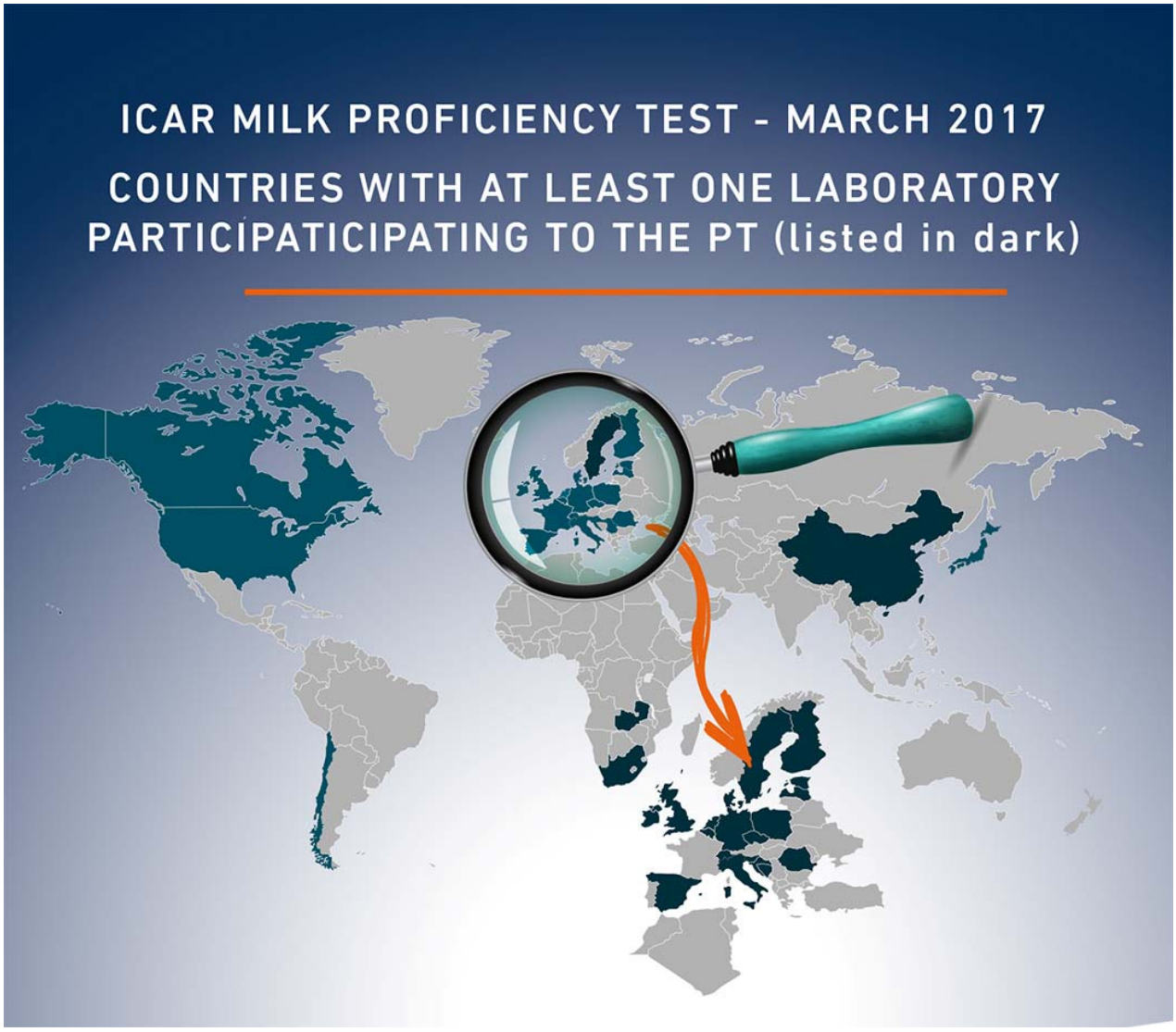
For each parameter the SR=standard deviation of reproducibility has been calculated after the outlier elimination. If you have participated, and your results are in the repeatability limits, you can use this value for the calculation of your uncertainty of measurement.

ICAR would like to see, in the next years, this 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 the ICAR PT 2017 (March) with at least one parameter is reported below and upload on ICAR website at:

http://www.icar.org/index.php/certifications/milk-analysis-laboratories-certifications/rresults-of-the-milk-laboratories-proficiency-test-march-2017



Laboratory	Country
Department Valorisation des productions Agricoles	Belgium
ILVO	Belgium
Valacta - Centre d'Expertise en Production Laitière du Québec	Canada
COOPRINSEM	Chile
Shangai dairy breeding center Co.Ltd	China
Croatian Agricultural Agency, Central Laboratory for Milk Quality Control	Croatia
Milkom a.s Dairy research institute	Czech Republic
Eurofins Steins Laboratory A/S	Denmark
Cattle Information Service (CIS)	England
Estonian Livestock Performance Recording Ltd	Estonia
Valio	Finland
Actalia	France
Milchprüfring Baden-Württemberg e.V.	Germany

Laboratory	Country
Teagasc Food research Center	Ireland
Central Milk Lab ICBA	Israel
Federazione Latterie Alto Adige Soc. Agr. Coop.	Italy
Laboratorio Standard Latte	Italy
Japan Dairy Technical Association	Japan
BIOR Institute of Food Safety, Animal Health and Enviroment	Latvia
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Poland
PFHBiPM Laboratorium w Bialymstoku zs.w jezewie Starym	Poland
PFHBiPM Laboratorium w Kobiernie	Poland
PFHBiPM Laboratorium w Parzniewie	Poland
PFHBiPM Region Oceny Bydgoszcz z/s w Minikowie	Poland
Holstein-Ro Breeders Association Laboratory	Romania
Laboratorija za ispitivanje kvaliteta mleka, Poljoprivredni fakultet Novi Sad,	Serbia
University of Ljubljana Biotechnical faculty department of Animal Science Institute of Dairy Science and Probiotics	Slovenia
Merieux NutriScience	South Africa
Merieux Nutriscience South Africa	South Africa
Merieux Nutriscience South Africa (Midrand)	South Africa
Lab oratorio Agroalimentario de Santander	Spain
Delaval international AB	Sweden
Eurofins Steins Laboratory A/B	Sweden
Agroscope Institute for food Sciences IFS	Switzerland
Taiwan Livestock research Insitute	Taiwan
Qlip B.V.,	The Netherlands
Eastern Lab services	USA

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

ICAR PT March 2017

Laboratory participation codes and Performance analyses

Laboratory Name	Name of the laboratory

A — Your participation Codes

	Fat_{ref}	$Protein_{ref}$	$Lactose_{ref}$	$Urea_{ref}$	SCCref/alt
Subscription	Yes	No	No	Yes	Yes
Participation Codes	105	105	104	105	107
Are all the sample results received ?	Yes	Yes	Yes	Yes	Yes

B — Data results received on time

Yes	No	Deadline
		17/03/2017

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

Fat	Protein*	Lactose	Urea	SCC
g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
Yes	No	Yes	No	Yes

*It was requested to report the value in total nitrogen

D — Outliers

Fat	Protein	Lactose	Urea	SCC
Sample	Sample	Sample	Sample	Sample
g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
	sample 7 Grubbs			Sample 4 Cochran

E — Repeatability

Your "r" performance

Fat	Protein	Lactose	Urea	SCC
g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml

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 13366-2	IDF 148-2
ISO 1211 IDF 1D	ISO 8968 IDF 20	ISO 22662 IDF 198	ISO 14637 IDF 195	Level	r
0,043	0,038	0,06	1,52	150	25
				300	42
				450	51
				750	64
				1500	126

F — Z-Score

Your Z-Score PT

Fat	Protein	Lactose	Urea	SCC
	sample 7			

Your FIX Z-Score

Fat	Protein	Lactose	Urea	SCC
	sample 7	Sample,1-2-3-7		Samp. 9

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

Fat	Protein	Lactose	Urea	SCC
	sd=0,034			

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

Indicative Limits defined in the ICAR MA SC

Fat	Protein	Lactose	Urea	SCC
g/100g	g/100g	g/100g	mg/dl	SCC*1000/ml
d=0,02	d=0,025	d=0,10	d=2,5	d=10%
sd=0,03	sd=0,020	sd=0,10	sd=1,5	sd=10%

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

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

ICAR
PROFICIENCY TESTING SCHEME

March 2017

Raw Milk

Determination of FAT CONTENT
Röse Gottlieb method

Sending date of statistical treatment : 21th April 2017

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

Proficiency test accreditated ISO 17043

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

Nb	%	N°	d	Sd	D	Method
1	5	13	+ 0,000	0,003	0,003	A
2	10	19	+ 0,002	0,003	0,004	A
3	15	20	- 0,000	0,005	0,005	A
4	20	11	- 0,001	0,005	0,005	A
5	25	9	+ 0,004	0,004	0,006	A
6	30	15	+ 0,005	0,003	0,006	A
7	35	14	+ 0,001	0,006	0,006	A
8	40	1	+ 0,006	0,006	0,008	A
9	45	2	+ 0,007	0,005	0,008	A
10	50	17	+ 0,008	0,006	0,010	A
11	55	3	+ 0,008	0,008	0,011	A
12	60	10	+ 0,007	0,010	0,012	A
13	65	12	- 0,014	0,010	0,017	A
14	70	7	+ 0,015	0,009	0,018	A
15	75	4	- 0,010	0,022	0,025	A
16	80	18	- 0,023	0,010	0,025	A
17	85	16	- 0,019	0,017	0,026	A
18	90	5	- 0,028	0,026	0,038	A
19	95	6	- 0,004	0,042	0,042	B
20	100	8	- 0,038	0,027	0,047	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 19 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}	0,006
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,014

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	0,005	0,008	0,011	0,001	0,014	0,005	0,004	0,002	0,006	0,006	0,005	20
2	0,009	0,008	0,013	0,004	0,006	0,007	0,006	0,004	0,003	0,009	0,005	20
3	0,004	0,001	0,011	0,006	0,003	0,005	0,002	0,002	0,011	0,003	0,004	20
4	0,023	0,024	0,009	0,020	0,019	0,004	0,018	0,009	0,006	0,010	0,011	20
5	0,010	0,030	0,030 *	0,000	0,030 *	0,000	0,000	0,000	0,000	0,000	0,012	20
6	0,010	0,000	0,000	0,010	0,010	0,000	0,020	0,000	0,010	0,000	0,006	20
7	0,038 *	0,039 *	0,005	0,005	0,001	0,022	0,009	0,004	0,028 *	0,005	0,015	20
8	0,002	0,003	0,003	0,002	0,005	0,004	0,003	0,005	0,001	0,008	0,003	20
9	0,008	0,008	0,002	0,007	0,003	0,007	0,010	0,009	0,002	0,006	0,005	20
10	0,003	0,001	0,001	0,008	0,006	0,003	0,011	0,002	0,002	0,000	0,004	20
11	0,002	0,008	0,009	0,005	0,008	0,004	0,004	0,004	0,009	0,008	0,005	20
12	0,014	0,006	0,004	0,006	0,001	0,004	0,020	0,005	0,001	0,001	0,006	20
13	0,008	0,000	0,004	0,003	0,004	0,009	0,003	0,002	0,003	0,002	0,003	20
14	0,002	0,017	0,014	0,008	0,004	0,005	0,003	0,005	0,004	0,005	0,006	20
15	0,001	0,010	0,008	0,002	0,000	0,013	0,010	0,005	0,005	0,003	0,005	20
16	0,018	0,000	0,012	0,004	0,004	0,002	0,002	0,011	0,006	0,014	0,007	20
17	0,012	0,006	0,007	0,000	0,007	0,002	0,004	0,008	0,004	0,005	0,004	20
18	0,006	0,004	0,004	0,017	0,006	0,011	0,001	0,058 *	0,006	0,008	0,014	20
19	0,006	0,008	0,006	0,012	0,000	0,022	0,001	0,001	0,003	0,002	0,006	20
20	0,015	0,002	0,002	0,011	0,004	0,017	0,007	0,001	0,001	0,003	0,006	20
Sr	0,009	0,010	0,007	0,006	0,007	0,007	0,006	0,010	0,006	0,004		400
NE	40	40	40	40	40	40	40	40	40	40		
L	0,028	0,030	0,022	0,023	0,020	0,027	0,026	0,014	0,015	0,017		

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	4,817	4,193	3,510	2,810	2,128	4,537	3,851	3,110	2,417	1,456
2	4,808	4,186	3,510	2,813	2,134	4,538	3,846	3,110	2,434	1,459
3	4,818	4,195	3,508	2,814	2,129	4,551	3,847	3,117	2,419	1,450
4	4,806	4,199	3,511	2,806	2,106	4,521	3,820	3,083	2,356 *	1,465
5	4,785	4,175	3,485	2,800	2,105	4,530	3,770 *	3,080	2,340 *	1,420 *
6	4,865	4,170	3,500	2,815	2,045 *	4,470 *	3,870	3,110	2,425	1,460
7	4,838	4,206	3,523	2,822	2,140	4,536	3,852	3,106	2,434	1,469
8	4,760	4,127 *	3,414 *	2,776	2,095	4,492 *	3,831	3,080	2,367 *	1,452
9	4,811	4,193	3,511	2,810	2,130	4,542	3,840	3,105	2,420	1,451
10	4,791	4,194	3,520	2,818	2,128	4,527	3,846	3,123	2,432	1,462
11	4,806	4,190	3,510	2,799	2,121	4,536	3,834	3,105	2,415	1,445
12	4,783	4,175	3,495	2,775	2,110	4,525	3,807	3,092	2,417	1,450
13	4,807	4,186	3,503	2,804	2,121	4,537	3,838	3,104	2,420	1,456
14	4,803	4,181	3,512	2,810	2,124	4,544	3,840	3,105	2,418	1,447
15	4,807	4,194	3,509	2,806	2,127	4,545	3,843	3,109	2,422	1,458
16	4,763	4,197	3,486	2,791	2,065 *	4,514	3,828	3,087	2,407	1,441
17	4,819	4,189	3,517	2,816	2,139	4,539	3,848	3,104	2,425	1,455
18	4,785	4,170	3,475	2,798	2,099	4,510	3,804	3,058	2,405	1,438
19	4,801	4,187	3,504	2,807	2,124	4,544	3,839	3,105	2,423	1,457
20	4,793	4,190	3,505	2,808	2,118	4,531	3,837	3,111	2,424	1,455
M	4,803	4,188	3,505	2,805	2,121	4,533	3,838	3,100	2,421	1,454
REF.	4,801	4,189	3,506	2,806	2,121	4,534	3,838	3,100	2,421	1,454
SD	0,024	0,010	0,012	0,012	0,013	0,011	0,016	0,016	0,008	0,008

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 19 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	7	7	5		5			18	7	
Outlier Grubbs		8	8		6; 16	6; 8	5		4; 5; 8	5
sr	0,007	0,008	0,006	0,006	0,005	0,007	0,007	0,004	0,004	0,004
SR	0,023	0,011	0,012	0,013	0,013	0,012	0,016	0,013	0,008	0,008

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	+ 0,016	+ 0,004	+ 0,003	+ 0,004	+ 0,007	+ 0,002	+ 0,013	+ 0,010	- 0,004	+ 0,002	+ 0,006	0,006	3,17
2	+ 0,007	- 0,003	+ 0,003	+ 0,007	+ 0,013	+ 0,003	+ 0,008	+ 0,010	+ 0,013	+ 0,005	+ 0,007	0,005	4,39
3	+ 0,017	+ 0,006	+ 0,001	+ 0,008	+ 0,007	+ 0,016	+ 0,009	+ 0,017	- 0,002	- 0,004	+ 0,008	0,008	3,12
4	+ 0,005	+ 0,010	+ 0,004	+ 0,000	- 0,016	- 0,013	- 0,018	- 0,018	- 0,065	+ 0,011	- 0,010	0,022	1,38
5	- 0,016	- 0,014	- 0,021	- 0,006	- 0,016	- 0,004	- 0,068	- 0,020	- 0,081	- 0,034	- 0,028	0,026	3,41
6	+ 0,064	- 0,019	- 0,006	+ 0,009	- 0,076	- 0,064	+ 0,032	+ 0,010	+ 0,004	+ 0,006	- 0,004	0,042	0,30
7	+ 0,037	+ 0,017	+ 0,016	+ 0,016	+ 0,018	+ 0,002	+ 0,014	+ 0,006	+ 0,013	+ 0,015	+ 0,015	0,009	5,23
8	- 0,041	- 0,062	- 0,093	- 0,030	- 0,027	- 0,042	- 0,007	- 0,021	- 0,054	- 0,002	- 0,038	0,027	4,40
9	+ 0,010	+ 0,004	+ 0,005	+ 0,004	+ 0,008	+ 0,007	+ 0,002	+ 0,004	- 0,001	- 0,003	+ 0,004	0,004	3,40
10	- 0,010	+ 0,005	+ 0,013	+ 0,012	+ 0,007	- 0,008	+ 0,008	+ 0,023	+ 0,011	+ 0,008	+ 0,007	0,010	2,26
11	+ 0,005	+ 0,001	+ 0,003	- 0,007	- 0,000	+ 0,002	- 0,004	+ 0,005	- 0,006	- 0,009	- 0,001	0,005	0,62
12	- 0,017	- 0,014	- 0,011	- 0,031	- 0,011	- 0,009	- 0,031	- 0,009	- 0,004	- 0,003	- 0,014	0,010	4,55
13	+ 0,006	- 0,003	- 0,003	- 0,002	- 0,000	+ 0,002	- 0,000	+ 0,004	- 0,001	+ 0,002	+ 0,000	0,003	0,47
14	+ 0,002	- 0,008	+ 0,006	+ 0,004	+ 0,003	+ 0,009	+ 0,002	+ 0,004	- 0,003	- 0,007	+ 0,001	0,006	0,69
15	+ 0,006	+ 0,005	+ 0,003	+ 0,000	+ 0,006	+ 0,010	+ 0,005	+ 0,008	+ 0,001	+ 0,004	+ 0,005	0,003	4,97
16	- 0,038	+ 0,008	- 0,020	- 0,015	- 0,056	- 0,020	- 0,010	- 0,014	- 0,014	- 0,013	- 0,019	0,017	3,50
17	+ 0,018	+ 0,000	+ 0,010	+ 0,010	+ 0,017	+ 0,005	+ 0,010	+ 0,004	+ 0,004	+ 0,001	+ 0,008	0,006	4,00
18	- 0,016	- 0,019	- 0,031	- 0,008	- 0,022	- 0,025	- 0,034	- 0,042	- 0,016	- 0,016	- 0,023	0,010	6,96
19	+ 0,000	- 0,002	- 0,002	+ 0,001	+ 0,003	+ 0,010	+ 0,001	+ 0,004	+ 0,002	+ 0,003	+ 0,002	0,003	1,85
20	- 0,008	+ 0,001	- 0,001	+ 0,002	- 0,003	- 0,004	- 0,001	+ 0,010	+ 0,003	+ 0,001	- 0,000	0,005	0,05
d	+ 0,002	- 0,001	- 0,002	- 0,001	- 0,000	- 0,001	+ 0,000	- 0,001	+ 0,000	+ 0,000	- 0,004	0,020	
Sd	0,024	0,010	0,012	0,012	0,013	0,011	0,016	0,016	0,008	0,008	0,014		

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

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

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

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+0,67	+0,42	+0,26	+0,30	+0,52	+0,22	+0,86	+0,61	-0,45	+0,32
2	+0,29	-0,30	+0,26	+0,59	+0,98	+0,31	+0,54	+0,61	+1,60	+0,64
3	+0,73	+0,57	+0,10	+0,67	+0,55	+1,50	+0,61	+1,06	-0,27	-0,52
4	+0,20	+1,03	+0,35	+0,02	-1,21	-1,21	-1,13	-1,16	-8,04	+1,47
5	-0,67	-1,42	-1,76	-0,46	-1,24	-0,38	-4,34	-1,32	-10,03	-4,31
6	+2,72	-1,93	-0,52	+0,75	-5,84	-5,90	+2,08	+0,61	+0,54	+0,83
7	+1,58	+1,69	+1,34	+1,27	+1,40	+0,17	+0,90	+0,35	+1,66	+1,92
8	-1,72	-6,38	-7,67	-2,38	-2,05	-3,87	-0,45	-1,35	-6,74	-0,20
9	+0,43	+0,42	+0,39	+0,30	+0,63	+0,68	+0,16	+0,26	-0,08	-0,33
10	-0,43	+0,47	+1,09	+0,99	+0,52	-0,70	+0,51	+1,45	+1,41	+1,09
11	+0,22	+0,11	+0,26	-0,58	-0,02	+0,17	-0,23	+0,29	-0,77	-1,10
12	-0,73	-1,41	-0,92	-2,47	-0,83	-0,82	-1,96	-0,57	-0,50	-0,43
13	+0,27	-0,30	-0,27	-0,18	-0,02	+0,22	-0,00	+0,23	-0,14	+0,32
14	+0,10	-0,86	+0,47	+0,35	+0,21	+0,86	+0,12	+0,26	-0,33	-0,90
15	+0,24	+0,52	+0,22	+0,02	+0,44	+0,95	+0,35	+0,52	+0,11	+0,51
16	-1,60	+0,83	-1,68	-1,18	-4,31	-1,85	-0,62	-0,90	-1,70	-1,61
17	+0,77	+0,01	+0,84	+0,83	+1,32	+0,45	+0,67	+0,23	+0,54	+0,12
18	-0,67	-1,93	-2,59	-0,66	-1,70	-2,27	-2,19	-2,73	-1,95	-2,00
19	+0,01	-0,20	-0,19	+0,10	+0,21	+0,91	+0,06	+0,26	+0,23	+0,45
20	-0,35	+0,11	-0,11	+0,14	-0,25	-0,34	-0,07	+0,64	+0,35	+0,12

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

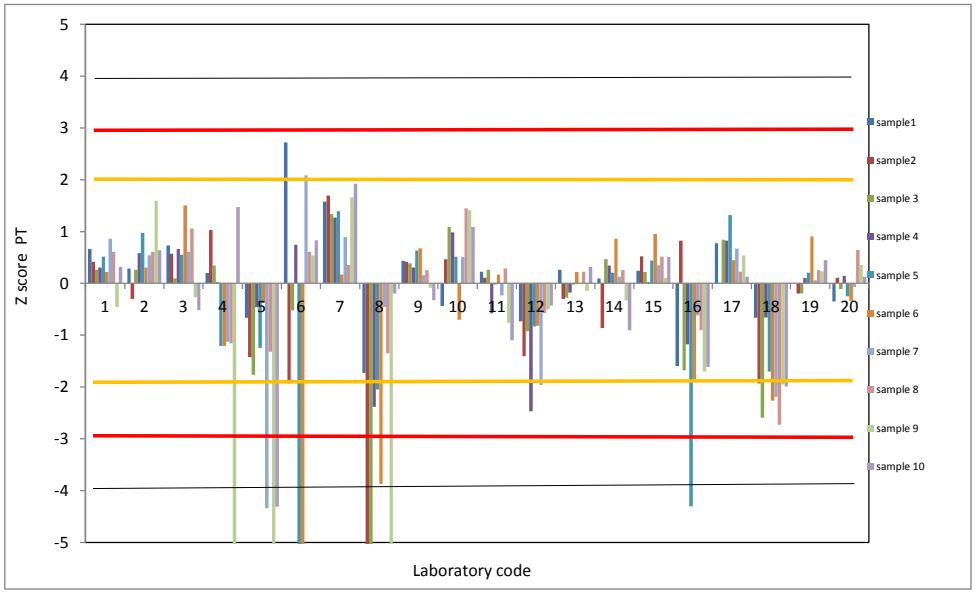


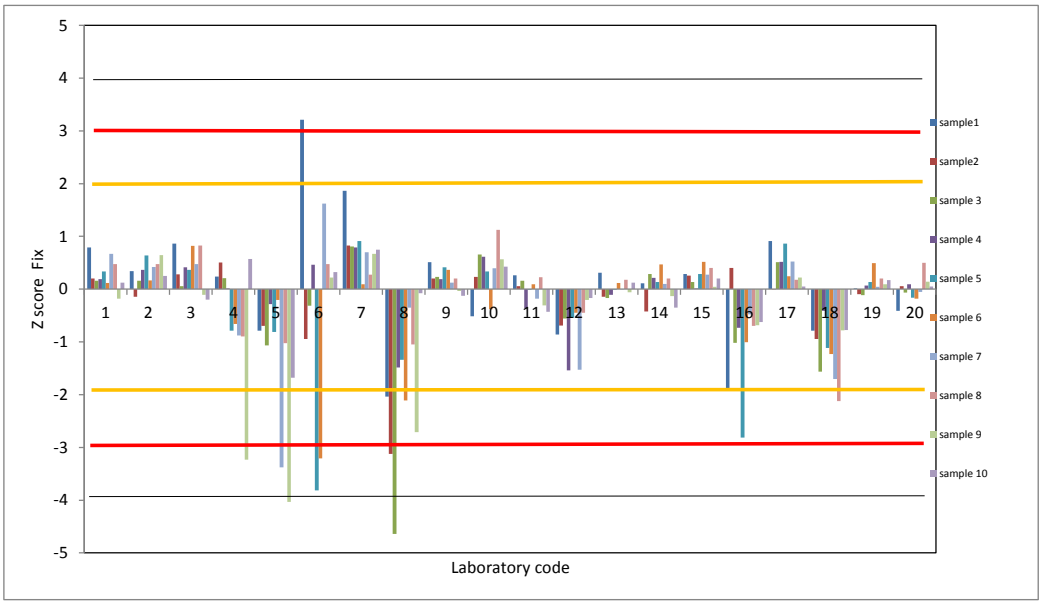
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+0,79	+0,20	+0,16	+0,19	+0,34	+0,12	+0,67	+0,48	-0,18	+0,12
2	+0,34	-0,15	+0,16	+0,37	+0,64	+0,17	+0,42	+0,48	+0,64	+0,25
3	+0,86	+0,28	+0,06	+0,42	+0,36	+0,82	+0,47	+0,83	-0,11	-0,20
4	+0,24	+0,50	+0,21	+0,02	-0,79	-0,66	-0,88	-0,90	-3,23	+0,57
5	-0,79	-0,70	-1,07	-0,28	-0,81	-0,21	-3,38	-1,02	-4,03	-1,68
6	+3,21	-0,95	-0,32	+0,47	-3,81	-3,21	+1,62	+0,48	+0,22	+0,32
7	+1,86	+0,83	+0,81	+0,79	+0,91	+0,09	+0,70	+0,28	+0,67	+0,75
8	-2,04	-3,12	-4,64	-1,48	-1,34	-2,11	-0,35	-1,05	-2,71	-0,08
9	+0,51	+0,20	+0,23	+0,19	+0,41	+0,37	+0,12	+0,20	-0,03	-0,13
10	-0,51	+0,23	+0,66	+0,62	+0,34	-0,38	+0,40	+1,13	+0,57	+0,42
11	+0,26	+0,05	+0,16	-0,36	-0,01	+0,09	-0,18	+0,23	-0,31	-0,43
12	-0,86	-0,69	-0,56	-1,54	-0,54	-0,45	-1,53	-0,45	-0,20	-0,17
13	+0,31	-0,15	-0,17	-0,11	-0,01	+0,12	-0,00	+0,18	-0,06	+0,12
14	+0,11	-0,42	+0,28	+0,22	+0,14	+0,47	+0,10	+0,20	-0,13	-0,35
15	+0,29	+0,25	+0,13	+0,02	+0,29	+0,52	+0,27	+0,40	+0,04	+0,20
16	-1,89	+0,40	-1,02	-0,73	-2,81	-1,01	-0,48	-0,70	-0,68	-0,63
17	+0,91	+0,00	+0,51	+0,52	+0,86	+0,24	+0,52	+0,18	+0,22	+0,05
18	-0,79	-0,95	-1,57	-0,41	-1,11	-1,23	-1,70	-2,12	-0,78	-0,78
19	+0,01	-0,10	-0,12	+0,07	+0,14	+0,49	+0,05	+0,20	+0,09	+0,17
20	-0,41	+0,05	-0,07	+0,09	-0,16	-0,18	-0,05	+0,50	+0,14	+0,05

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



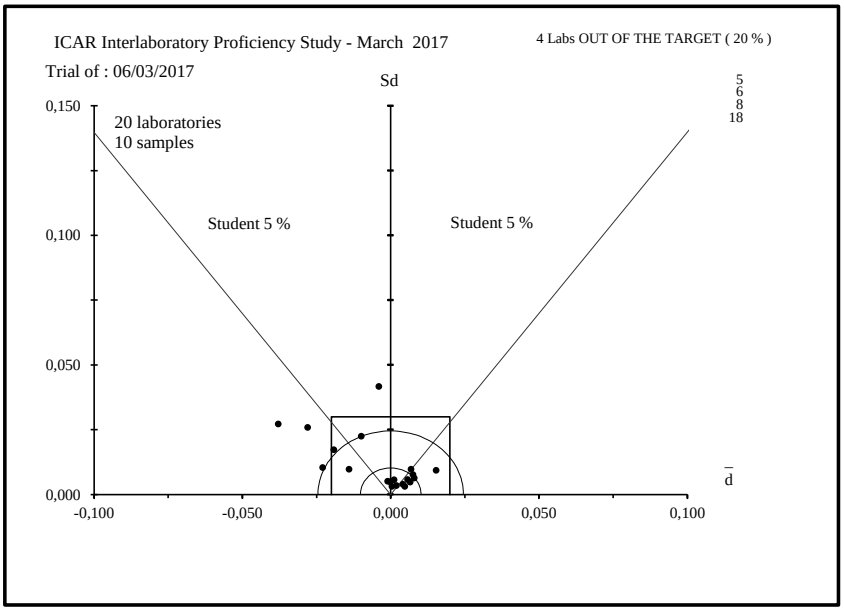


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST

RAW MILK

FAT CONTENT Röse Göttlieb
March 2017

Lab name	City	Country
ACTALIA	POLIGNY	FRANCE
AGROSCOPE	LIEBEFELD	SWITZERLAND
AIA-LAB. STANDARD LATTE	MACCARESE (ROMA)	ITALY
BIOR INST.of FOOD SAFETY, ANIMAL HEALTH and ENVIROMENT	RIGA	LATVIA
CENTRAL MILK LABORATORY - ICBA	CAESAREA	ISRAEL
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
EASTERN LAB SERVICES	MEDINA	USA
ESTONIAN LIVESTOCK PERFORMANCE RECORDING Ltd	TARTU	ESTONIE
ILVO	MELLE	BELGIUM
JAPAN DAIRY TECHNICAL ASSOCIATION	TOKYO	JAPAN
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LAB. OCENY MLEKA KCHZ	PARZNIEWIE	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
MILKOM a.s DAIRY RESEARCH INSTITUTE	PRAHA	CZECH REPUBLIC
QLIP N.V.	CM ZUTPHEN	NETHERLAND
TEAGASC FOOD RESEARCH CENTER	FERMOY CO-CORK	IRELAND
UNIV OF LJUBLJANA	DOMZALE	SLOVENIA
VALACTA	STE ANNE DE BELLEVUE	CANADA
VALIO	LAPINLAHTI	FINLAND

ICAR
PROFICIENCY TESTING SCHEME

March 2017

Raw Milk

Determination of CRUDE PROTEIN CONTENT
KJELDAHL Method

Sending date of statistical treatment : **21th April 2017**

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

Proficiency test accreditated ISO 17043

ACTALIA CECALAIT

cofrac COMPARAISONS INTERLABORATOIRES

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

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

Nb	%	N°	d	Sd	D
1	5	13	+ 0,007	0,005	0,008
2	10	2	+ 0,001	0,009	0,009
3	15	9	+ 0,003	0,008	0,009
4	20	11	- 0,008	0,007	0,011
5	25	20	- 0,003	0,011	0,011
6	30	10	- 0,001	0,012	0,012
7	35	3	+ 0,002	0,012	0,012
8	40	16	+ 0,012	0,005	0,013
9	45	7	- 0,012	0,010	0,015
10	50	4	- 0,015	0,006	0,016
11	55	12	- 0,015	0,007	0,016
12	60	18	- 0,013	0,010	0,017
13	65	14	- 0,017	0,006	0,018
14	70	17	+ 0,015	0,011	0,019
15	75	5	+ 0,017	0,016	0,023
16	80	15	+ 0,025	0,005	0,025
17	85	6	+ 0,026	0,013	0,029
18	90	8	- 0,028	0,009	0,029
19	95	1	+ 0,020	0,034	0,039
20	100	19	+ 0,013	0,061	0,062

(1)

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

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 19 laboratories using the reference method (ISO 8968-1|IDF 20-1), after outlier discarging using Grubbs test at 5% risk level

(1) : ISO 8968-3/IDF 20-3; NPN: VDLUFA, Methodenbuch Band VI, C 30.3

(NC : OUT of RANKING because of insufficient data number)
(Nb : laboratory rank; % : relative rank)
(N° : laboratory identification number)
(d et Sd : mean and standard deviation of the differences (laboratory -reference))
(D : Euclidian distance to YX-axis origin = SQUARE ROOT.(d^2 + Sd^2))

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

Repeatability standard deviation of this ICAR proficiency test (after Cochran elimination at 5 %)	Sr_{PT}	0,007
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,018

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	0,018	0,009	0,006	0,009	0,004	0,002	0,003	0,007	0,005	0,005	0,006	20
2	0,002	0,001	0,000	0,023	0,001	0,018	0,003	0,010	0,005	0,022	0,009	20
3	0,000	0,019	0,019	0,006	0,013	0,006	0,000	0,032 *	0,013	0,006	0,010	20
4	0,008	0,006	0,008	0,007	0,006	0,011	0,004	0,010	0,007	0,006	0,005	20
5	0,064 *	0,006	0,013	0,070 *	**	0,013	0,013	0,070 *	0,070 *	0,026	0,033	18
6	0,036	0,000	0,017	0,008	0,003	0,004	0,013	0,001	0,001	0,009	0,010	20
7	0,003	0,001	0,001	0,006	0,005	0,009	0,007	0,004	0,001	0,004	0,003	20
8	0,011	0,004	0,008	0,004	0,010	0,010	0,008	0,005	0,015	0,001	0,006	20
9	0,004	0,004	0,004	0,003	0,001	0,003	0,003	0,004	0,001	0,000	0,002	20
10	0,001	0,005	0,011	0,002	0,003	0,004	0,003	0,011	0,008	0,008	0,005	20
11	0,001	0,002	0,003	0,015	0,005	0,008	0,003	0,007	0,006	0,011	0,005	20
12	0,008	0,004	0,005	0,006	0,003	0,024	0,013	0,002	0,031	0,003	0,010	20
13	0,006	0,006	0,000	0,006	0,000	0,000	0,000	0,000	0,006	0,006	0,003	20
14	0,018	0,007	0,004	0,013	0,004	0,014	0,004	0,008	0,021	0,005	0,008	20
15	0,001	0,011	0,009	0,014	0,003	0,010	0,010	0,007	0,006	0,004	0,006	20
16	0,001	0,003	0,009	0,001	0,001	**	**	**	**	**	0,003	10
17	0,003	0,005	0,005	0,004	0,013	0,009	0,005	0,000	0,017	0,003	0,006	20
18	0,026	0,005	0,038 *	0,007	0,008	0,022	0,004	0,001	0,016	0,005	0,012	20
19	0,017	0,017	0,003	0,001	0,002	0,006	0,011	0,025 *	0,008	0,011	0,009	20
20	0,001	0,007	0,000	0,002	0,006	0,005	0,005	0,007	0,006	0,000	0,003	20
Sr	0,013	0,005	0,008	0,013	0,004	0,008	0,005	0,014	0,014	0,007		388
NE	40	40	40	40	38	38	38	38	38	38		
L	0,036	0,022	0,024	0,025	0,017	0,032	0,020	0,017	0,034	0,027		

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

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

(*) : Data modified in right units.

Sample/Lab code	1	2	3	4	5	6	7	8	9	10
(*) 1	3,778	3,590	3,305	2,973	2,778	3,697	3,608 *	3,145	2,885	3,311
2	3,801	3,597	3,317	2,935	2,746	3,677	3,516	3,126	2,851	3,306
3	3,783	3,621	3,308	2,944	2,769	3,697	3,490	3,117	2,839	3,321
4	3,785	3,589	3,296	2,921	2,723	3,683	3,493	3,109	2,828	3,291
5	3,790	3,633	3,330	2,976		3,713	3,509	3,155	2,849	3,311
6	3,836	3,621	3,330	2,953	2,790	3,710	3,551	3,137	2,870	3,330
7	3,793	3,597	3,282	2,933	2,722	3,684	3,498	3,102	2,843	3,291
8	3,770	3,566	3,278	2,913	2,730	3,655	3,467	3,094	2,833	3,278
9	3,807	3,608	3,313	2,940	2,737	3,703	3,512	3,117	2,847	3,309
10	3,778	3,590	3,289	2,932	2,758	3,694	3,514	3,130	2,843	3,331
11	3,790	3,604	3,304	2,919	2,738	3,684	3,499	3,105	2,839	3,305
12	3,769	3,589	3,290	2,925	2,737	3,670	3,497	3,114	2,819	3,303
13	3,793	3,614	3,318	2,944	2,750	3,700	3,522	3,126	2,849	3,314
14	3,781	3,588	3,291	2,921	2,726	3,670	3,488	3,107	2,820	3,300
15	3,817	3,631	3,334	2,969	2,763	3,716	3,535	3,142	2,868	3,337
16	3,804	3,615	3,323	2,945	2,760					
17	3,802	3,626	3,323	2,956	2,762	3,707	3,538	3,125	2,875	3,303
18	3,780	3,589	3,277	2,934	2,730	3,688	3,493	3,115	2,816	3,309
19	3,775	3,596	3,297	2,926	2,741	3,683	3,494	3,121	2,867	3,494 *
20	3,777	3,590	3,288	2,931	2,755	3,690	3,512	3,127	2,841	3,330
M	3,790	3,603	3,305	2,940	2,748	3,691	3,507	3,122	2,846	3,310
REF.	3,789	3,603	3,305	2,940	2,749	3,692	3,507	3,122	2,847	3,311
SD	0,017	0,018	0,018	0,018	0,019	0,016	0,021	0,016	0,019	0,015

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 19 laboratories using the reference method ISO 8968-1|IDF 20-1, after outliers discarging using Grubbs test at 5% risk level.

Table IV : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran	5			5				3; 5	5	
Outlier Grubbs							1			19
sr	0,009	0,005	0,006	0,006	0,004	0,008	0,005	0,005	0,009	0,007
SR	0,019	0,018	0,018	0,017	0,019	0,017	0,021	0,015	0,021	0,016

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	- 0,012	- 0,013	+ 0,000	+ 0,033	+ 0,030	+ 0,005	+ 0,101	+ 0,023	+ 0,037	+ 0,000	+ 0,020	0,034	1,91
2	+ 0,011	- 0,006	+ 0,012	- 0,004	- 0,003	- 0,015	+ 0,009	+ 0,004	+ 0,003	- 0,005	+ 0,001	0,009	0,23
3	- 0,006	+ 0,017	+ 0,003	+ 0,005	+ 0,020	+ 0,005	- 0,017	- 0,005	- 0,008	+ 0,010	+ 0,002	0,012	0,63
4	- 0,004	- 0,014	- 0,009	- 0,019	- 0,026	- 0,009	- 0,014	- 0,013	- 0,020	- 0,020	- 0,015	0,006	7,37
5	+ 0,000	+ 0,030	+ 0,026	+ 0,037		+ 0,021	+ 0,002	+ 0,033	+ 0,001	+ 0,001	+ 0,017	0,016	3,23
6	+ 0,047	+ 0,017	+ 0,025	+ 0,013	+ 0,041	+ 0,018	+ 0,044	+ 0,015	+ 0,023	+ 0,020	+ 0,026	0,013	6,56
7	+ 0,003	- 0,006	- 0,023	- 0,006	- 0,026	- 0,007	- 0,009	- 0,020	- 0,005	- 0,019	- 0,012	0,010	3,91
8	- 0,020	- 0,038	- 0,027	- 0,027	- 0,019	- 0,037	- 0,040	- 0,028	- 0,014	- 0,032	- 0,028	0,009	10,14
9	+ 0,017	+ 0,005	+ 0,009	- 0,000	- 0,012	+ 0,011	+ 0,005	- 0,005	- 0,001	- 0,002	+ 0,003	0,008	0,99
10	- 0,012	- 0,013	- 0,016	- 0,008	+ 0,009	+ 0,002	+ 0,007	+ 0,008	- 0,005	+ 0,020	- 0,001	0,012	0,20
11	+ 0,001	+ 0,000	- 0,001	- 0,021	- 0,010	- 0,007	- 0,008	- 0,017	- 0,008	- 0,006	- 0,008	0,007	3,42
12	- 0,020	- 0,014	- 0,014	- 0,014	- 0,011	- 0,022	- 0,010	- 0,008	- 0,028	- 0,008	- 0,015	0,007	7,29
13	+ 0,003	+ 0,011	+ 0,013	+ 0,005	+ 0,001	+ 0,009	+ 0,015	+ 0,004	+ 0,001	+ 0,004	+ 0,007	0,005	4,22
14	- 0,009	- 0,015	- 0,014	- 0,018	- 0,022	- 0,022	- 0,019	- 0,015	- 0,027	- 0,010	- 0,017	0,006	9,46
15	+ 0,028	+ 0,028	+ 0,029	+ 0,029	+ 0,014	+ 0,024	+ 0,028	+ 0,020	+ 0,020	+ 0,026	+ 0,025	0,005	15,57
16	+ 0,015	+ 0,012	+ 0,019	+ 0,005	+ 0,012						+ 0,012	0,005	5,67
17	+ 0,013	+ 0,023	+ 0,018	+ 0,016	+ 0,013	+ 0,015	+ 0,031	+ 0,003	+ 0,027	- 0,008	+ 0,015	0,011	4,21
18	- 0,010	- 0,014	- 0,028	- 0,005	- 0,019	- 0,004	- 0,014	- 0,007	- 0,032	- 0,002	- 0,013	0,010	4,21
19	- 0,015	- 0,008	- 0,008	- 0,014	- 0,008	- 0,009	- 0,013	- 0,001	+ 0,020	+ 0,184	+ 0,013	0,061	0,67
20	- 0,013	- 0,014	- 0,016	- 0,009	+ 0,006	- 0,002	+ 0,004	+ 0,005	- 0,006	+ 0,019	- 0,003	0,011	0,73
d	+ 0,001	- 0,001	- 0,000	- 0,000	- 0,001	- 0,001	- 0,000	- 0,000	- 0,001	- 0,001	+ 0,001	0,023	
Sd	0,017	0,018	0,018	0,018	0,019	0,016	0,021	0,016	0,019	0,015	0,018		

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

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

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

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-0,70	-0,75	+0,03	+1,82	+1,55	+0,32	+4,93	+1,45	+1,91	+0,00
2	+0,67	-0,34	+0,67	-0,24	-0,16	-0,94	+0,42	+0,26	+0,16	-0,29
3	-0,36	+0,97	+0,18	+0,26	+1,05	+0,33	-0,84	-0,35	-0,43	+0,66
4	-0,26	-0,81	-0,48	-1,06	-1,35	-0,58	-0,69	-0,83	-1,03	-1,27
5	+0,02	+1,69	+1,41	+2,02		+1,32	+0,09	+2,09	+0,06	+0,04
6	+2,76	+0,97	+1,39	+0,72	+2,14	+1,14	+2,16	+0,97	+1,18	+1,28
7	+0,18	-0,34	-1,27	-0,36	-1,38	-0,46	-0,42	-1,30	-0,24	-1,24
8	-1,15	-2,11	-1,47	-1,47	-0,98	-2,29	-1,96	-1,81	-0,73	-2,09
9	+1,03	+0,27	+0,48	-0,01	-0,63	+0,67	+0,23	-0,33	-0,04	-0,13
10	-0,70	-0,75	-0,87	-0,43	+0,47	+0,11	+0,35	+0,51	-0,24	+1,30
11	+0,05	+0,02	-0,03	-1,17	-0,55	-0,46	-0,41	-1,10	-0,43	-0,40
12	-1,19	-0,81	-0,79	-0,79	-0,59	-1,38	-0,47	-0,52	-1,45	-0,52
13	+0,20	+0,61	+0,71	+0,26	+0,05	+0,53	+0,71	+0,26	+0,06	+0,25
14	-0,51	-0,84	-0,77	-1,01	-1,17	-1,38	-0,94	-0,96	-1,40	-0,67
15	+1,63	+1,57	+1,59	+1,60	+0,74	+1,48	+1,36	+1,26	+1,05	+1,69
16	+0,88	+0,67	+1,02	+0,29	+0,60					
17	+0,77	+1,30	+0,99	+0,89	+0,67	+0,93	+1,49	+0,18	+1,39	-0,52
18	-0,59	-0,79	-1,52	-0,29	-0,98	-0,25	-0,69	-0,43	-1,63	-0,13
19	-0,87	-0,43	-0,43	-0,75	-0,40	-0,54	-0,63	-0,08	+1,03	+11,91
20	-0,75	-0,77	-0,91	-0,50	+0,32	-0,15	+0,21	+0,32	-0,32	+1,24

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

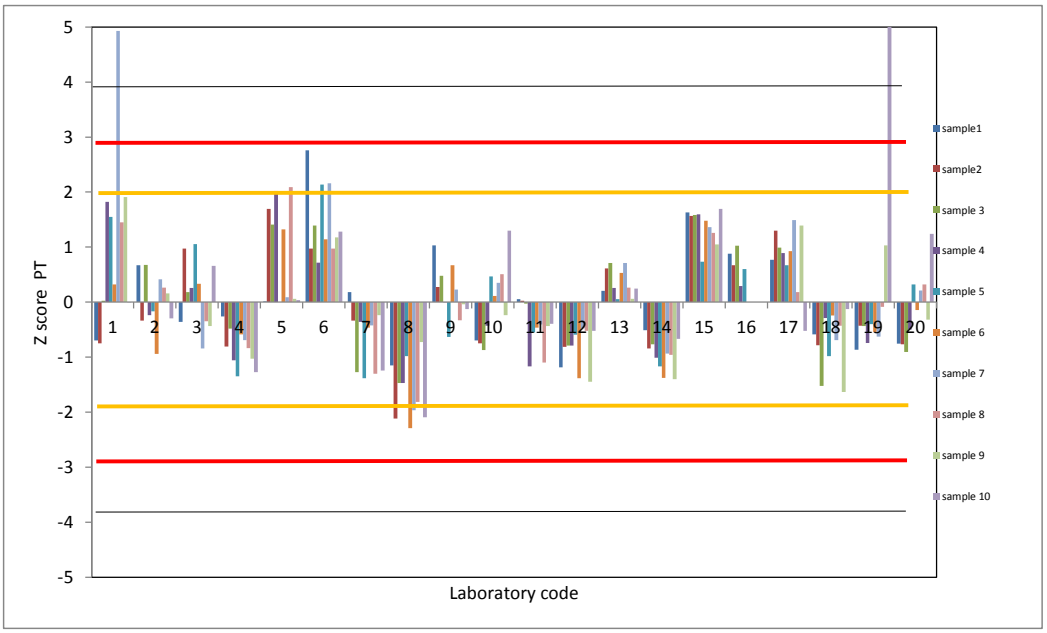


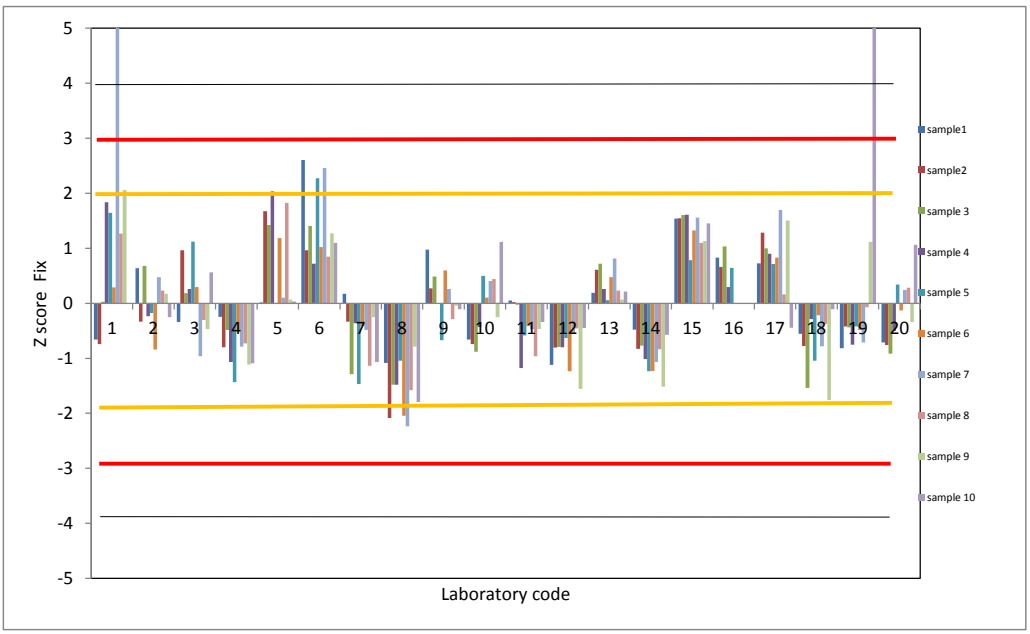
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-0,66	-0,74	+0,03	+1,83	+1,64	+0,29	+5,62	+1,26	+2,06	+0,00
2	+0,64	-0,33	+0,68	-0,24	-0,17	-0,84	+0,47	+0,23	+0,17	-0,25
3	-0,34	+0,96	+0,18	+0,26	+1,12	+0,30	-0,96	-0,30	-0,47	+0,56
4	-0,25	-0,80	-0,48	-1,07	-1,43	-0,52	-0,79	-0,73	-1,11	-1,09
5	+0,01	+1,67	+1,42	+2,03		+1,18	+0,10	+1,82	+0,07	+0,03
6	+2,60	+0,96	+1,41	+0,72	+2,27	+1,02	+2,46	+0,85	+1,27	+1,10
7	+0,17	-0,33	-1,29	-0,36	-1,47	-0,41	-0,48	-1,14	-0,25	-1,07
8	-1,08	-2,09	-1,48	-1,48	-1,04	-2,04	-2,24	-1,58	-0,79	-1,79
9	+0,97	+0,27	+0,49	-0,01	-0,67	+0,60	+0,26	-0,29	-0,04	-0,11
10	-0,66	-0,74	-0,88	-0,43	+0,50	+0,10	+0,40	+0,44	-0,25	+1,11
11	+0,05	+0,02	-0,03	-1,18	-0,58	-0,41	-0,47	-0,96	-0,47	-0,34
12	-1,12	-0,80	-0,80	-0,80	-0,63	-1,23	-0,54	-0,46	-1,56	-0,45
13	+0,19	+0,61	+0,72	+0,26	+0,06	+0,47	+0,81	+0,23	+0,07	+0,21
14	-0,48	-0,83	-0,77	-1,02	-1,24	-1,23	-1,07	-0,84	-1,51	-0,57
15	+1,54	+1,55	+1,60	+1,61	+0,78	+1,32	+1,55	+1,10	+1,13	+1,45
16	+0,83	+0,66	+1,03	+0,29	+0,64					
17	+0,72	+1,28	+1,00	+0,90	+0,71	+0,83	+1,70	+0,16	+1,50	-0,45
18	-0,55	-0,78	-1,54	-0,29	-1,04	-0,22	-0,78	-0,37	-1,76	-0,11
19	-0,82	-0,42	-0,44	-0,75	-0,42	-0,48	-0,71	-0,07	+1,11	+10,21
20	-0,71	-0,76	-0,91	-0,50	+0,34	-0,13	+0,24	+0,28	-0,34	+1,06

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=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



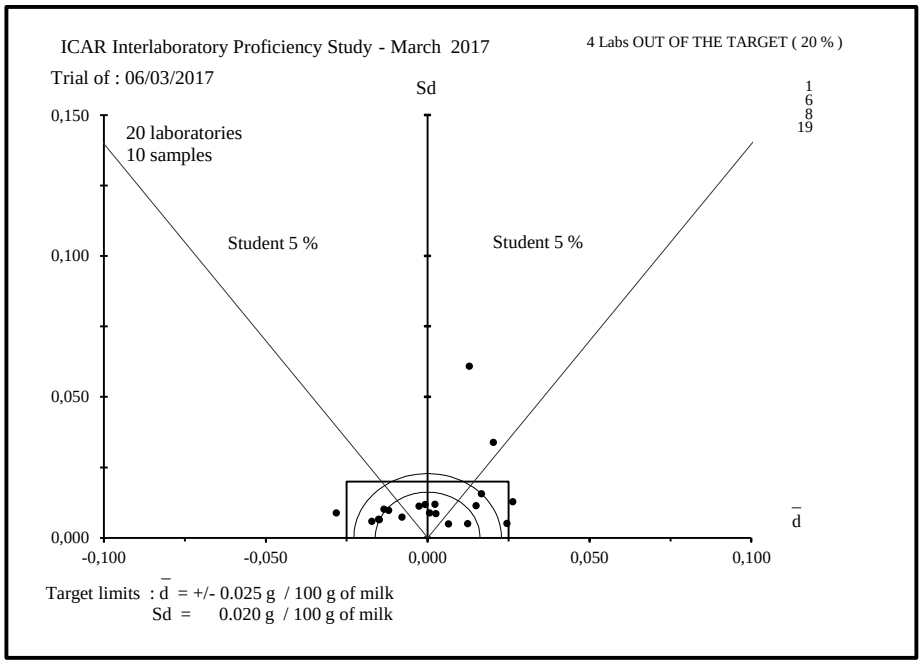


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST

RAW MILK
NITROGEN CONTENT
March 2017

Name	City	Country
ACTALIA	POLIGNY	FRANCE
AGROSCOPE	LIEBEFELD	SWITZERLAND
AIA-LAB. STANDARD LATTE	MACCARESE (ROMA)	ITALY
BIOR INST.of FOOD SAFETY, ANIMAL HEALTH and ENVIROMENT	RIGA	LATVIA
CENTRAL MILK LABORATORY - ICBA	CAESAREA	ISRAEL
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
EASTERN LAB SERVICES	MEDINA	USA
ESTONIAN LIVESTOCK PERFORMANCE RECORDING Ltd	TARTU	ESTONIE
ILVO	MELLE	BELGIUM
JAPAN DAIRY TECHNICAL ASSOCIATION	TOKYO	JAPAN
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LAB. OCENY MLEKA KCHZ	PARZNIEWIE	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
MILKOM a.s DAIRY RESEARCH INSTITUTE	PRAHA	CZECH REPUBLIC
QLIP N.V.	CM ZUTPHEN	NETHERLAND
TEAGASC FOOD RESEARCH CENTER	FERMOY CO-CORK	IRELAND
UNIV OF LJUBLJANA	DOMZALE	SLOVENIA
VALACTA	STE ANNE DE BELLEVUE	CANADA
VALIO	LAPINLAHTI	FINLAND

ICAR

PROFICIENCY TESTING SCHEME

March 2017

Raw Milk

Determination of LACTOSE CONTENT

Sending date of statistical treatment : 21th April 2017

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

ACTALIA CECALAIT

cofrac COMPARAISONS INTERLABORATOIRES

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

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

Nb	%	N°	d	Sd	D	**Method**
1	7	7	- 0,002	0,012	0,012	HPLC
2	13	12	- 0,001	0,014	0,014	HPLC
3	20	13	+ 0,014	0,010	0,017	Enzy
4	27	11	+ 0,020	0,012	0,023	HPLC
5	33	8	- 0,005	0,024	0,025	Enzy
6	40	2	- 0,024	0,012	0,026	own method
7	47	6	- 0,017	0,025	0,030	HPLC
8	53	1	- 0,029	0,044	0,053	Enzy
9	60	15	- 0,002	0,067	0,067	HPLC
10	67	4	- 0,065	0,020	0,068	ASU L 01.00-17 with Enzymatic Test Kit from Roche
11	73	5	- 0,055	0,061	0,082	Enzy
12	80	9	+ 0,041	0,084	0,093	Lane-Eynon method
13	87	10	- 0,063	0,104	0,121	analyse à flux continu
14	93	3	+ 0,118	0,028	0,121	Polarimeter
15	100	14	+ 0,139	0,023	0,141	Enzymatic method SOP 2 (IDF 79B:1991)

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

laboratories are located according to an acceptability area (or target)
the limits of which are :

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 15 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}	0,072

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	0,002	0,001	0,010	0,001	0,002	0,003	0,000	0,001	0,001	0,002	20
2	0,009	0,001	0,002	0,001	0,006	0,006	0,003	0,005	0,013	0,006	0,004	20
3	0,010	0,010	0,010	0,010	0,000	0,000	0,000	0,000	0,000	0,000	0,004	20
4	0,018	0,037	0,017	0,018	0,018	0,018	0,019	0,053	0,017	0,000	0,018	20
5	0,016	0,013	0,014	0,018	0,004	0,006	0,003	0,010	0,012	0,006	0,008	20
6	0,018	0,016	0,023	0,011	0,016	0,014	0,002	0,027	0,010	0,006	0,011	20
7	0,033	0,017	0,006	0,005	0,010	0,011	0,002	0,002	0,013	0,007	0,010	20
8	0,028	0,002	0,017	0,008	0,041 *	0,033	0,018	0,034	0,002	0,001	0,016	20
9	0,007	0,002	0,007	0,009	0,019	0,009	0,012	0,011	0,014	0,004	0,007	20
10	0,019	0,000	0,000	0,000	0,010	0,068 *	0,049 *	0,019	0,058 *	0,000	0,024	20
11	0,013	0,009	0,021	0,002	0,005	0,002	0,015	0,021	0,010	0,009	0,009	20
12	0,004	0,013	0,007	0,001	0,002	0,007	0,006	0,004	0,006	0,006	0,005	20
13	0,057	0,004	0,005	0,012	0,002	0,006	0,009	0,024	0,006	0,016	0,015	20
14	0,006	0,008	0,010	0,007	0,012	0,022	0,018	0,002	0,025	0,035 *	0,012	20
15	0,016	0,041	0,043	0,028	0,008	0,025	0,009	0,056	0,010	0,012	0,021	20
Sr	0,015	0,012	0,011	0,008	0,010	0,016	0,012	0,018	0,013	0,008		300
NE	30	30	30	30	30	30	30	30	30	30		
L	0,058	0,045	0,043	0,032	0,027	0,039	0,028	0,067	0,031	0,018		

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	LACT
1	4,978	5,011	4,890	4,940	4,847	4,853	4,825	4,831	4,743	4,831	
2	5,050	5,105	4,915	4,985	4,838	4,853	4,787	4,802	4,696	4,775	4,885
3	5,205	5,275	5,065	5,135	4,980	5,000	4,940	4,920	4,800	4,900	4,911
4	5,026	5,081	4,855	4,947	4,789	4,820	4,728	4,764	4,637	4,741	4,826
5	4,975	4,948	4,858	4,912	4,801	4,823	4,789	4,819	4,784	4,779	4,915
6	5,075	5,130	4,932	4,982	4,821	4,852	4,778	4,840	4,695	4,765	4,914
7	5,062	5,138	4,937	5,005	4,849	4,872	4,809	4,825	4,721	4,799	4,925
8	5,090	5,104	4,889	5,021	4,881	4,870	4,808	4,798	4,714	4,812	4,947
9	5,058	5,142	4,963	4,977	4,898	4,915	4,801	4,884	4,714	5,095	4,898
10	5,019	5,136	4,854	4,932	4,772	4,743	4,636	4,699	4,602	5,019	4,585
11	5,068	5,155	4,940	5,016	4,890	4,903	4,847	4,853	4,736	4,832	4,894
12	5,072	5,138	4,936	5,006	4,846	4,879	4,811	4,830	4,716	4,799	4,919
13	5,090	5,142	4,944	5,002	4,876	4,876	4,826	4,860	4,737	4,825	4,961
14	5,226	5,280	5,074	5,170	4,978	5,002	4,950	4,972	4,856	4,925	
15	5,070	5,099	5,022	5,038	4,939	4,852	4,834	4,749	4,718	4,696	4,745
M	5,071	5,125	4,938	5,004	4,867	4,874	4,811	4,830	4,724	4,839	
REF.	5,062	5,124	4,934	4,994	4,865	4,870	4,810	4,829	4,724	4,826	4,912
SD	0,069	0,083	0,070	0,070	0,063	0,065	0,075	0,067	0,061	0,106	

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, 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					8	10	10		10	14
Outlier Grubbs										
sr	0,015	0,012	0,011	0,008	0,007	0,011	0,008	0,018	0,008	0,005
SR	0,070	0,083	0,070	0,070	0,065	0,057	0,059	0,068	0,053	0,107

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	- 0,084	- 0,113	- 0,044	- 0,054	- 0,019	- 0,017	+ 0,014	+ 0,002	+ 0,018	+ 0,004	- 0,029	0,044	2,10
2	- 0,012	- 0,020	- 0,019	- 0,010	- 0,027	- 0,017	- 0,024	- 0,027	- 0,029	- 0,051	- 0,024	0,012	6,41
3	+ 0,143	+ 0,151	+ 0,131	+ 0,141	+ 0,115	+ 0,130	+ 0,130	+ 0,091	+ 0,076	+ 0,074	+ 0,118	0,028	13,24
4	- 0,036	- 0,044	- 0,079	- 0,047	- 0,076	- 0,050	- 0,083	- 0,065	- 0,088	- 0,085	- 0,065	0,020	10,57
5	- 0,087	- 0,177	- 0,076	- 0,082	- 0,064	- 0,047	- 0,022	- 0,010	+ 0,060	- 0,047	- 0,055	0,061	2,86
6	+ 0,013	+ 0,006	- 0,002	- 0,013	- 0,044	- 0,018	- 0,032	+ 0,011	- 0,029	- 0,061	- 0,017	0,025	2,17
7	- 0,000	+ 0,013	+ 0,003	+ 0,010	- 0,016	+ 0,002	- 0,001	- 0,004	- 0,004	- 0,028	- 0,002	0,012	0,66
8	+ 0,028	- 0,020	- 0,045	+ 0,027	+ 0,015	- 0,000	- 0,002	- 0,031	- 0,010	- 0,015	- 0,005	0,024	0,71
9	- 0,004	+ 0,018	+ 0,029	- 0,018	+ 0,032	+ 0,045	- 0,009	+ 0,055	- 0,010	+ 0,269	+ 0,041	0,084	1,52
10	- 0,042	+ 0,012	- 0,080	- 0,062	- 0,093	- 0,127	- 0,174	- 0,130	- 0,122	+ 0,193	- 0,063	0,104	1,90
11	+ 0,006	+ 0,030	+ 0,006	+ 0,022	+ 0,024	+ 0,033	+ 0,036	+ 0,024	+ 0,012	+ 0,005	+ 0,020	0,012	5,23
12	+ 0,010	+ 0,013	+ 0,002	+ 0,011	- 0,019	+ 0,009	+ 0,001	+ 0,001	- 0,008	- 0,027	- 0,001	0,014	0,18
13	+ 0,029	+ 0,017	+ 0,010	+ 0,008	+ 0,010	+ 0,006	+ 0,016	+ 0,032	+ 0,013	- 0,001	+ 0,014	0,010	4,46
14	+ 0,164	+ 0,156	+ 0,140	+ 0,175	+ 0,113	+ 0,132	+ 0,140	+ 0,143	+ 0,131	+ 0,098	+ 0,139	0,023	19,27
15	+ 0,008	- 0,026	+ 0,088	+ 0,044	+ 0,074	- 0,018	+ 0,023	- 0,080	- 0,006	- 0,130	- 0,002	0,067	0,11
d	+ 0,009	+ 0,001	+ 0,004	+ 0,010	+ 0,001	+ 0,004	+ 0,001	+ 0,001	+ 0,000	+ 0,013	+ 0,005	0,072	
Sd	0,069	0,083	0,070	0,070	0,063	0,065	0,075	0,067	0,061	0,106	0,074		

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	-1,23	-1,36	-0,64	-0,78	-0,30	-0,26	+0,19	+0,03	+0,30	+0,04
2	-0,18	-0,24	-0,27	-0,14	-0,43	-0,26	-0,32	-0,41	-0,48	-0,48
3	+2,08	+1,82	+1,88	+2,01	+1,82	+2,00	+1,74	+1,36	+1,24	+0,70
4	-0,52	-0,53	-1,14	-0,68	-1,21	-0,76	-1,11	-0,97	-1,44	-0,81
5	-1,26	-2,13	-1,09	-1,18	-1,02	-0,72	-0,29	-0,14	+0,98	-0,45
6	+0,19	+0,07	-0,04	-0,18	-0,70	-0,27	-0,43	+0,16	-0,48	-0,58
7	-0,00	+0,16	+0,04	+0,14	-0,26	+0,03	-0,02	-0,05	-0,06	-0,26
8	+0,41	-0,24	-0,65	+0,38	+0,24	-0,00	-0,03	-0,46	-0,17	-0,14
9	-0,06	+0,21	+0,41	-0,26	+0,51	+0,69	-0,12	+0,82	-0,17	+2,54
10	-0,62	+0,14	-1,14	-0,89	-1,48	-1,95	-2,33	-1,94	-2,01	+1,83
11	+0,08	+0,36	+0,08	+0,31	+0,38	+0,51	+0,49	+0,36	+0,19	+0,05
12	+0,15	+0,16	+0,02	+0,16	-0,31	+0,14	+0,01	+0,02	-0,14	-0,26
13	+0,42	+0,21	+0,14	+0,11	+0,17	+0,10	+0,21	+0,47	+0,21	-0,01
14	+2,39	+1,88	+2,01	+2,50	+1,79	+2,03	+1,87	+2,14	+2,15	+0,93
15	+0,12	-0,31	+1,26	+0,62	+1,17	-0,28	+0,31	-1,19	-0,11	-1,23

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

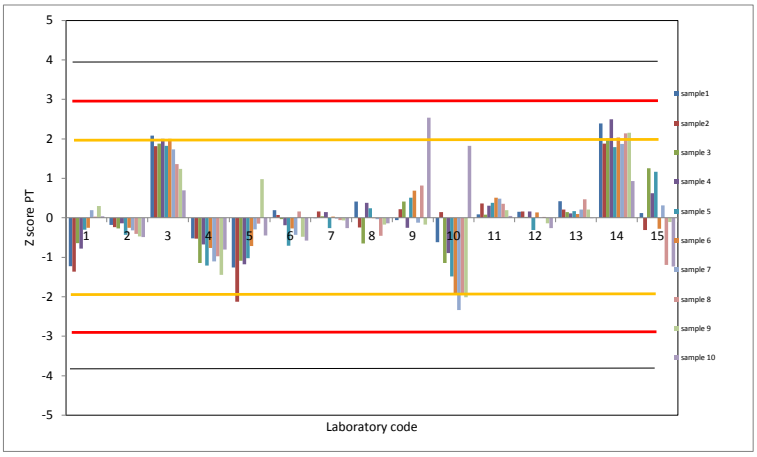


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

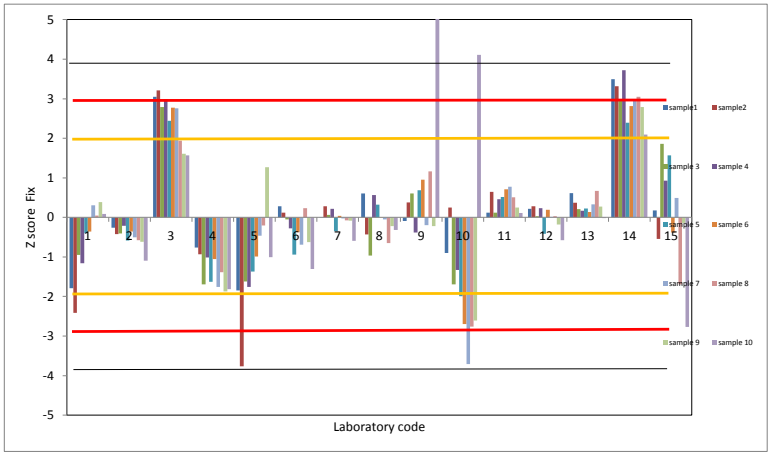
Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-1,79	-2,41	-0,95	-1,16	-0,40	-0,35	+0,30	+0,05	+0,38	+0,09
2	-0,26	-0,42	-0,40	-0,21	-0,58	-0,35	-0,50	-0,58	-0,62	-1,09
3	+3,05	+3,21	+2,79	+2,99	+2,44	+2,77	+2,76	+1,94	+1,61	+1,57
4	-0,76	-0,93	-1,69	-1,01	-1,62	-1,06	-1,76	-1,39	-1,87	-1,81
5	-1,84	-3,76	-1,62	-1,75	-1,37	-0,99	-0,46	-0,21	+1,27	-1,00
6	+0,28	+0,12	-0,05	-0,28	-0,94	-0,37	-0,69	+0,23	-0,63	-1,30
7	-0,00	+0,28	+0,06	+0,21	-0,35	+0,04	-0,03	-0,08	-0,08	-0,59
8	+0,60	-0,43	-0,97	+0,56	+0,32	-0,00	-0,05	-0,65	-0,22	-0,31
9	-0,09	+0,38	+0,61	-0,38	+0,68	+0,96	-0,20	+1,17	-0,22	+5,72
10	-0,90	+0,25	-1,69	-1,33	-1,99	-2,70	-3,71	-2,76	-2,61	+4,11
11	+0,12	+0,64	+0,12	+0,46	+0,51	+0,71	+0,77	+0,51	+0,25	+0,11
12	+0,22	+0,28	+0,03	+0,24	-0,41	+0,19	+0,02	+0,03	-0,18	-0,58
13	+0,61	+0,37	+0,21	+0,17	+0,22	+0,14	+0,33	+0,67	+0,27	-0,02
14	+3,50	+3,31	+2,98	+3,72	+2,40	+2,82	+2,97	+3,05	+2,79	+2,09
15	+0,18	-0,55	+1,86	+0,93	+1,57	-0,39	+0,50	-1,70	-0,14	-2,77

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



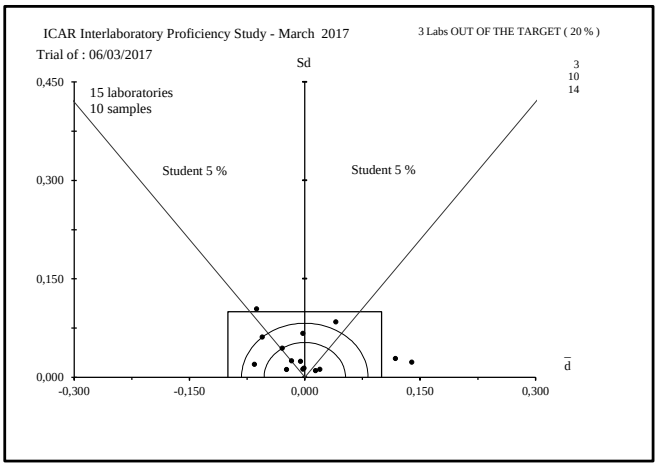


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF PARTICIPANT LABORATORIES
RAW MILK

LACTOSE CONTENT
MARCH 2017

AGROSCOPE	LIEBEFELD	SWITZERLAND
AIA-LAB. STANDARD LATTE	MACCARESE (ROMA)	ITALY
BIOR INST.of FOOD SAFETY, ANIMAL HEALTH and ENVIROMENT	RIGA	LATVIA
DEPARTEMENT QUALITE CRA-W	GEMBLOUX	BELGIUM
EASTERN LAB SERVICES	MEDINA	USA
ILVO	MELLE	BELGIUM
JAPAN DAIRY TECHNICAL ASSOCIATION	TOKYO	JAPAN
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LAB. OCENY MLEKA KCHZ	PARZNIEWIE	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
MILKOM a.s DAIRY RESEARCH INSTITUTE	PRAHA	CZECH REPUBLIC
QLIP N.V.	CM ZUTPHEN	NETHERLAND
TEAGASC FOOD RESEARCH CENTER	FERMOY CO-CORK	IRELAND
UNIV OF LJUBLJANA	DOMZALE	SLOVENIA
VALACTA	STE ANNE DE BELLEVUE	CANADA

ICAR
PROFICIENCY TESTING SCHEME

March 2017

Raw Milk

Determination of UREA CONTENT

Sending date of statistical treatment : 21th April 2017

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	8	5	- 0,86	0,39	0,94	diff.pH
2	15	3	- 0,80	0,54	0,96	(1)
3	23	7	+ 0,76	0,68	1,02	diff.pH
4	31	4	+ 0,87	0,67	1,10	diff.pH
5	38	6	+ 0,73	0,84	1,12	(2)
6	46	10	- 1,46	0,40	1,51	diff.pH
7	54	12	- 1,37	0,86	1,62	diff.pH
8	62	9	+ 1,28	1,25	1,79	´(2)
9	69	11	- 1,80	0,44	1,86	diff.pH
10	77	1	+ 2,21	0,63	2,30	diff.pH
11	85	2	- 0,48	2,32	2,37	diff.pH
12	92	13	+ 4,53	13,03	13,80	diff.pH
13	100	8	+ 4,72	13,16	13,98	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 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}	0,46
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	5,27

(1) Internal method
(2) Continuous flow analyzer

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	0,43	0,64	0,21	0,21	0,43	0,21	0,43	0,21	0,43	0,21	0,26	20
2	0,90	0,70	0,10	0,40	0,30	0,10	1,30	0,00	1,20	0,50	0,50	20
3	1,70	0,50	0,70	0,40	2,30 *	1,00	1,70	2,30 *	1,50	1,60 *	1,07	20
4	0,08	0,23	0,36	0,09	0,10	0,12	0,17	0,22	0,62	0,09	0,19	20
5	0,30	0,60	0,10	0,10	0,10	2,00	0,40	0,00	0,60	0,20	0,50	20
6	0,10	0,20	0,20	0,20	0,80	0,30	0,10	0,10	0,20	0,20	0,22	20
7	0,70	0,50	0,20	0,50	1,10	0,20	0,20	1,00	0,60	0,20	0,43	20
8	0,60	0,50	0,50	0,50	0,20	0,10	1,20	0,60	0,30	0,00	0,39	20
9	0,25	1,08	0,43	0,06	0,97	1,58	0,47	0,63	0,01	0,03	0,52	20
10	0,00	0,20	0,20	0,20	0,10	0,10	0,10	1,20	0,40	0,30	0,30	20
11	0,81	0,98	1,08	0,17	0,81	0,86	0,44	0,10	0,71	0,29	0,50	20
12	0,40	0,20	1,40	1,10	0,10	0,10	0,80	0,80	0,30	0,90 *	0,53	20
13	0,20	0,20	0,00	0,40	1,00	0,30	0,10	0,40	0,90	0,30	0,35	20
Sr	0,47	0,41	0,41	0,30	0,62	0,57	0,54	0,60	0,51	0,40		260
NE	26	26	26	26	26	26	26	26	26	26		
L	1,72	1,50	1,50	1,10	1,61	2,10	1,97	1,49	1,85	0,63		

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**

(*) : Data modified in right units.

	Sample / Lab Code	1	2	3	4	5	6	7	8	9	10
(*)	1	35,95	45,48	31,57	21,51	63,34	49,11	26,75	53,82	58,85	40,77
	2	26,65 *	42,65	29,25	18,90	61,35	47,35	24,15	54,20	57,80	37,95
	3	32,75	42,45	28,35	18,40	60,15	47,30	23,05	51,25	55,75	37,60
	4	35,04	43,04	29,38	19,83	62,88	48,05	24,36	53,39	58,51	39,34
	5	32,45	41,30	27,85	19,05	60,35	47,90	23,40	51,20	55,90	37,10
	6	33,55	43,10	29,00	19,20	63,10	48,55	24,35	53,55	58,90	39,10
	7	33,65	43,45	29,20	19,55	63,25	48,70	24,60	53,70	58,10	38,50
	8	33,40	42,45	29,75	62,25	62,10	48,65	25,60	51,90	57,35	38,80
	9	34,88	43,56	28,88	19,54	64,67	48,13	24,21	54,60	59,57	39,77
	10	31,90	41,30	27,20	18,10	60,45	46,15	22,85	50,00	55,90	36,65
	11	31,72	40,32	27,57	17,66	60,30	45,50	22,34	50,52	55,40	35,68
	12	32,50	41,80	27,30	18,95	58,85	47,65	22,60	51,00	54,05	36,65
	13	33,40	42,80	29,80	61,70	62,00	47,55	25,05	52,20	56,75	39,15
	M	33,43	42,59	28,85	25,74	61,75	47,74	24,10	52,41	57,14	38,23
	REF.	33,29	42,35	28,83	20,10	61,51	47,71	24,14	52,19	56,90	38,04
	SD	1,30	1,28	1,21	16,11	1,67	1,02	1,26	1,54	1,66	1,45

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 : Outlier identification

Sample	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Outliers Cochran					3			3		3; 12
Outlier Grubbs	2									
sr	0,45	0,41	0,41	0,30	0,45	0,57	0,54	0,41	0,51	0,18
SR	1,34	1,31	1,25	16,11	1,70	1,10	1,32	1,59	1,69	1,49

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	+ 2,66	+ 3,13	+ 2,73	+ 1,41	+ 1,84	+ 1,41	+ 2,61	+ 1,63	+ 1,95	+ 2,72	+ 2,21	0,63	11,07
2	- 6,64	+ 0,30	+ 0,42	- 1,20	- 0,16	- 0,36	+ 0,01	+ 2,01	+ 0,90	- 0,09	- 0,48	2,32	0,65
3	- 0,54	+ 0,10	- 0,48	- 1,70	- 1,36	- 0,41	- 1,09	- 0,94	- 1,15	- 0,44	- 0,80	0,54	4,70
4	+ 1,75	+ 0,69	+ 0,55	- 0,28	+ 1,37	+ 0,34	+ 0,22	+ 1,20	+ 1,61	+ 1,29	+ 0,87	0,67	4,14
5	- 0,84	- 1,05	- 0,98	- 1,05	- 1,16	+ 0,19	- 0,74	- 0,99	- 1,00	- 0,94	- 0,86	0,39	6,99
6	+ 0,26	+ 0,75	+ 0,17	- 0,90	+ 1,59	+ 0,84	+ 0,21	+ 1,36	+ 2,00	+ 1,06	+ 0,73	0,84	2,77
7	+ 0,36	+ 1,10	+ 0,37	- 0,55	+ 1,74	+ 0,99	+ 0,46	+ 1,51	+ 1,20	+ 0,46	+ 0,76	0,68	3,58
8	+ 0,11	+ 0,10	+ 0,92	+ 42,15	+ 0,59	+ 0,94	+ 1,46	- 0,29	+ 0,45	+ 0,76	+ 4,72	13,16	1,13
9	+ 1,60	+ 1,21	+ 0,05	- 0,56	+ 3,16	+ 0,43	+ 0,07	+ 2,40	+ 2,67	+ 1,73	+ 1,28	1,25	3,22
10	- 1,39	- 1,05	- 1,63	- 2,00	- 1,06	- 1,56	- 1,29	- 2,19	- 1,00	- 1,39	- 1,46	0,40	11,44
11	- 1,57	- 2,03	- 1,26	- 2,44	- 1,21	- 2,21	- 1,80	- 1,67	- 1,49	- 2,36	- 1,80	0,44	12,90
12	- 0,79	- 0,55	- 1,53	- 1,15	- 2,66	- 0,06	- 1,54	- 1,19	- 2,85	- 1,39	- 1,37	0,86	5,02
13	+ 0,11	+ 0,45	+ 0,97	+ 41,60	+ 0,49	- 0,16	+ 0,91	+ 0,01	- 0,15	+ 1,11	+ 4,53	13,03	1,10
d	+ 0,14	+ 0,24	+ 0,02	+ 5,64	+ 0,25	+ 0,03	- 0,04	+ 0,22	+ 0,24	+ 0,19	+ 0,64	5,38	
Sd	1,30	1,28	1,21	16,11	1,67	1,02	1,26	1,54	1,66	1,45	5,26		

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	+2,04	+2,44	+2,25	+0,09	+1,10	+1,38	+2,07	+1,06	+1,18	+1,88
2	-5,09	+0,24	+0,35	-0,07	-0,09	-0,35	+0,01	+1,30	+0,55	-0,06
3	-0,41	+0,08	-0,40	-0,11	-0,81	-0,40	-0,86	-0,61	-0,69	-0,31
4	+1,34	+0,54	+0,45	-0,02	+0,82	+0,34	+0,17	+0,78	+0,97	+0,89
5	-0,64	-0,82	-0,81	-0,07	-0,69	+0,19	-0,58	-0,65	-0,60	-0,65
6	+0,20	+0,59	+0,14	-0,06	+0,95	+0,83	+0,17	+0,88	+1,21	+0,73
7	+0,28	+0,86	+0,30	-0,03	+1,04	+0,97	+0,37	+0,98	+0,73	+0,31
8	+0,09	+0,08	+0,76	+2,62	+0,36	+0,93	+1,16	-0,19	+0,27	+0,52
9	+1,22	+0,94	+0,04	-0,03	+1,89	+0,42	+0,06	+1,56	+1,61	+1,19
10	-1,07	-0,82	-1,34	-0,12	-0,63	-1,52	-1,02	-1,43	-0,60	-0,96
11	-1,21	-1,59	-1,03	-0,15	-0,72	-2,16	-1,43	-1,09	-0,90	-1,63
12	-0,60	-0,43	-1,26	-0,07	-1,59	-0,05	-1,22	-0,78	-1,72	-0,96
13	+0,09	+0,35	+0,80	+2,58	+0,30	-0,15	+0,72	+0,00	-0,09	+0,76

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

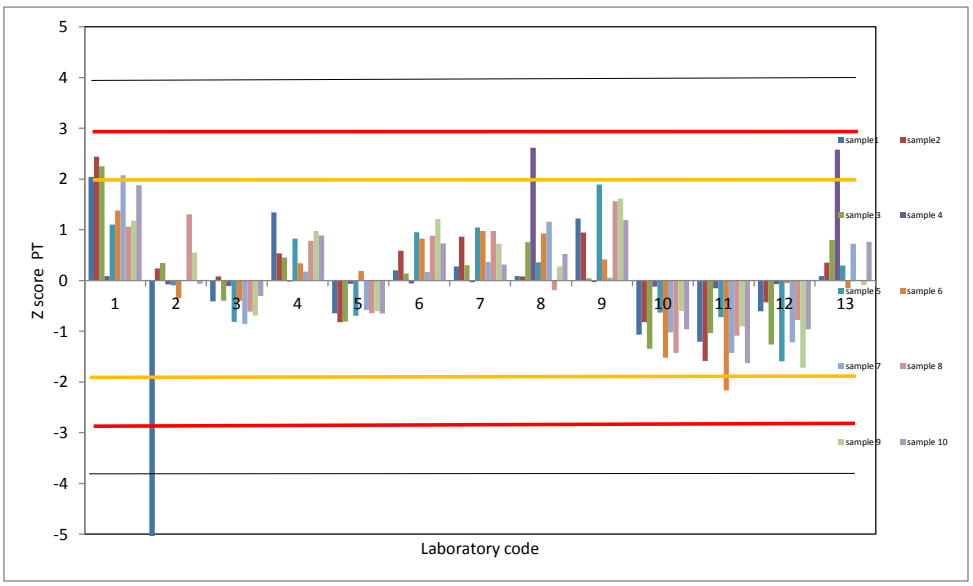


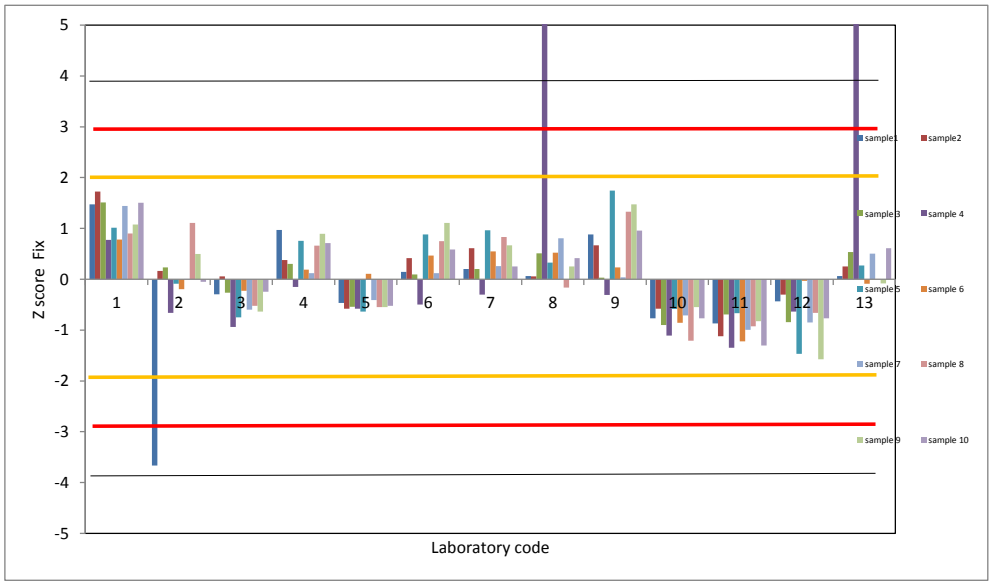
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	+1,47	+1,73	+1,51	+0,78	+1,02	+0,78	+1,44	+0,90	+1,08	+1,50
2	-3,67	+0,17	+0,23	-0,66	-0,09	-0,20	+0,01	+1,11	+0,50	-0,05
3	-0,30	+0,06	-0,27	-0,94	-0,75	-0,22	-0,60	-0,52	-0,63	-0,25
4	+0,97	+0,38	+0,30	-0,15	+0,76	+0,19	+0,12	+0,66	+0,89	+0,71
5	-0,46	-0,58	-0,54	-0,58	-0,64	+0,11	-0,41	-0,55	-0,55	-0,52
6	+0,14	+0,42	+0,09	-0,50	+0,88	+0,47	+0,12	+0,75	+1,11	+0,58
7	+0,20	+0,61	+0,20	-0,30	+0,96	+0,55	+0,26	+0,83	+0,66	+0,25
8	+0,06	+0,06	+0,51	+23,3	+0,33	+0,52	+0,81	-0,16	+0,25	+0,42
9	+0,88	+0,67	+0,03	-0,31	+1,75	+0,24	+0,04	+1,33	+1,48	+0,95
10	-0,77	-0,58	-0,90	-1,11	-0,58	-0,86	-0,71	-1,21	-0,55	-0,77
11	-0,87	-1,12	-0,69	-1,35	-0,67	-1,22	-0,99	-0,92	-0,83	-1,31
12	-0,44	-0,30	-0,85	-0,64	-1,47	-0,03	-0,85	-0,66	-1,57	-0,77
13	+0,06	+0,25	+0,54	+23,0	+0,27	-0,09	+0,50	+0,00	-0,08	+0,61

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



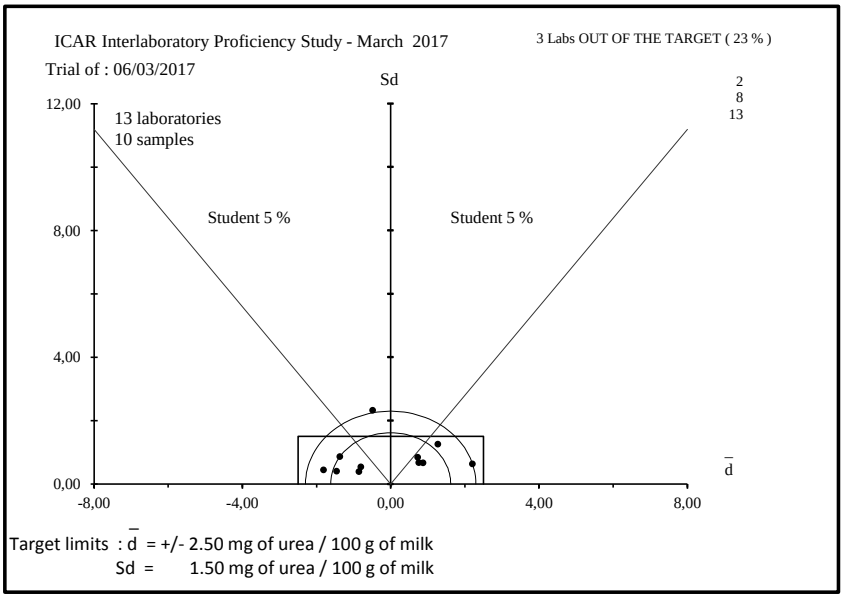


Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST
RAW MILK
UREA CONTENT
March 2017

Name	City	Country
ACTALIA	POLIGNY	FRANCE
AGROSCOPE	LIEBEFELD	SWITZERLAND
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	ESTONIE
LAB. OCENY MLEKA KCHZ	PARZNIEWIE	POLAND
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
QLIP N.V.	CM ZUTPHEN	NETHERLAND
UNIV OF LJUBLJANA	DOMZALE	SLOVENIA
VALACTA	STE ANNE DE BELLEVUE	CANADA

ICAR
PROFICIENCY TESTING SCHEME

March 2017

Raw Milk

Enumeration of SOMATIC CELLS

Sending date of statistical treatment : 21th April 2017

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

Proficiency test accreditated ISO 17043

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

Table I : **Ranking of the laboratories in %**

Nb	%	N°	d	Sd	D	Method
1	3	21	- 0%	2%	2%	B
2	6	4	- 2%	1%	2%	B
3	9	12	- 2%	2%	3%	B
4	11	31	- 2%	3%	3%	B
5	14	10	+ 3%	3%	4%	B
6	17	13	- 4%	4%	5%	B
7	20	3	- 4%	5%	6%	B
8	23	14	- 5%	4%	7%	B
9	26	19	- 6%	5%	8%	B
10	29	33	+ 8%	3%	8%	B
11	31	15	- 6%	5%	8%	B
12	34	35	- 8%	2%	9%	B
13	37	26	- 7%	6%	9%	B
14	40	32	+ 8%	5%	9%	B
15	43	9	- 6%	8%	10%	A
16	46	29	- 9%	3%	10%	B
17	49	24	- 9%	7%	12%	B
18	51	1	- 9%	8%	12%	B
19	54	30	+ 8%	9%	12%	A
20	57	18	- 9%	8%	12%	B
21	60	8	- 9%	9%	12%	B
22	63	17	- 10%	8%	13%	B
23	66	28	- 12%	12%	17%	B
24	69	5	+ 13%	12%	17%	B
25	71	34	+ 18%	3%	18%	B
26	74	23	+ 15%	13%	20%	B
27	77	2	- 17%	13%	21%	B
28	80	11	+ 17%	15%	22%	A
29	83	7	- 18%	15%	23%	B
30	86	6	- 15%	19%	24%	A
31	89	25	- 17%	18%	25%	C
32	91	16	+ 21%	14%	25%	B
33	94	20	+ 20%	16%	26%	A
34	97	27	+ 20%	18%	27%	B
35	100	22	+ 22%	16%	28%	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 33 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
C CCD camera

(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	3%
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	85	16%

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	3	9	3	97 *	23	10	23	5	11	15	23	20
2	1	1	2	10	3	1	8	13	2	31	8	20
3	3	3	9	63	13	25	44	21	43	27	22	20
4	10	1	3	27	21	53	7	6	20	8	15	20
5	1	8	7	21	5	6	4	15	6	48	13	20
6	0	10	18	13	7	2	13	13	4	42	12	20
7	4	6	3	11	4	18	9	10	21	20	9	20
8	3	9	7	8	29	26	15	7	37	34	15	20
9	10	14	4	37	18	18	9	19	84 *	70	27	20
10	2	2	4	12	19	6	8	8	20	4	7	20
11	1	0	2	10	5	15	4	5	10	10	5	20
12	6	9	15	20	12	2	18	10	41	9	12	20
13	11	1	4	34	11	12	34	15	4	24	13	20
14	2	4	4	19	11	14	11	6	13	58	15	20
15	0	5	3	16	14	12	6	2	47	44	16	20
16	4	1	206 *	34	15	15	17	7	26	59	49	20
17	4	11	13	1	18	18	5	10	12	11	8	20
18	1	9	3	19	8	14	16	2	7	27	9	20
19	2	0	0	2	0	8	5	4	10	2	3	20
20	0	6	1	38	3	12	7	5	24	0	11	20
21	5	0	2	2	2	22	16	4	17	18	8	20
22	7	3	1	39	30	44	32	10	21	53	21	20
23	7	2	3	58	31	26	42	2	102 *	112	39	20
24	4	4	2	1	5	13	1	2	17	13	6	20
25	5	6	15	2	30	6	15	12	4	20	10	20
26	2	4	5	30	0	2	2	12	20	35	12	20
27	1	10	14	9	13	3	4	13	8	18	8	20
28	0	4	0	5	6	12	8	4	8	31	8	20
29	1	3	16	10	13	2	25	6	10	47	13	20
30	2	6	7	16	4	11	18	3	8	44	12	20
31	1	2	11	2	1	6	13	12	15	57	14	20
32	2	4	19	39	5	6	28	13	5	60	18	20
33	2	14	15	6	12	7	22	19	42	44	16	20
34	2	3	5	0	22	19	9	11	11	3	8	20
35	0	2	9	22	6	14	14	1	12	5	8	20
Sr	3	4	25	21	11	12	13	7	21	28		700
r	25	25	42	126	50	63	63	42	126	126		
NE	70	70	70	70	70	70	70	70	70	70		
L	13	19	26	74	45	53	55	31	63	120		

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

(*) : Data modified in right units.

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	44	83	139	855	342	480	605	227	911	1208
2	43	77	136	755	314	418	551	212	885	1080
3	56	96	166	882	374	482	621	246	992	1236
4	51	90	162	904	367	494	651	246	1059	1272
5	51	100	182	1034	423	571	748	276	1208	1463
6	52	100	141	756	332	430	650	246	872	984
7	37	75	130	744	320	419	532	211	896	1037
8	53	93	156	842	351	474	618	230	956	1147
9	56	100	161	878	350	490	612	257	1027	1150
10	57	91	170	963	395	515	689	259	1102	1293
11	55	104	193	1033	435	589	785	299	1278	1512
12	46	91	158	901	359	504	626	242	1046	1281
13	49	87	150	863	361	493	655	249	1035	1232
14	48	93	158	859	356	473	619	246	1012	1226
15	42	89	150	853	360	487	625	235	1006	1189
16	58	110	298 *	1111	453	603	788	310	1245	1524
17	45	78	138	814	350	471	596	218	947	1177
18	46	84	151	846	338	461	607	238	972	1144
19	50	82	151	844	360	470	620	250	989	1222
20	58	114	212	1119	462	591	780	289	1282	1532
21	52	88	159	931	389	512	640	252	1045	1286
22	65	118	205	1125	487	616	816	322	1249	1573
23	56	104	191	1059	428	582	759	297	1239	1480
24	48	85	152	846	347	458	585	233	962	1173
25	43	88	145	761	332	444	555	244	862	994
(*) 26	45	88	162	854	357	479	611	237	979	1209
27	66	104	190	1122	452	593	776	298	1274	1569
28	64	97	162	791	332	451	574	234	922	1116
29	48	94	152	818	333	458	612	228	962	1168
30	57	125	176	1062	420	550	709	253	1093	1346
31	48	93	151	892	380	497	662	251	1067	1258
32	53	91	188	996	416	533	713	256	1124	1424
33	58	96	174	1002	419	530	727	278	1127	1386
34	56	109	184	1103	441	603	765	305	1256	1532
35	49	86	152	850	350	470	594	233	963	1180
M	51	94	163	916	379	505	659	254	1052	1274
REF.	51	94	163	922	380	508	663	254	1060	1284
SD	7	12	20	118	46	57	78	29	130	166

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 33 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			16	1					9; 23	
Outlier Grubbs			16							
sr	3	4	6	17	11	12	13	7	15	28
SR	7	12	21	120	47	57	79	29	130	168
sr %	6%	5%	4%	2%	3%	2%	2%	3%	1%	2%
SR %	14%	13%	13%	13%	12%	11%	12%	11%	12%	13%

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	- 15%	- 12%	- 15%	- 7%	- 10%	- 5%	- 9%	- 11%	- 14%	- 6%	- 9%	8%	3,65
2	- 17%	- 18%	- 16%	- 18%	- 17%	- 18%	- 17%	- 17%	- 17%	- 16%	- 17%	13%	4,05
3	+ 8%	+ 2%	+ 2%	- 4%	- 2%	- 5%	- 6%	- 3%	- 6%	- 4%	- 4%	5%	2,85
4	- 1%	- 4%	- 1%	- 2%	- 3%	- 3%	- 2%	- 3%	- 0%	- 1%	- 2%	1%	4,13
5	- 2%	+ 7%	+ 12%	+ 12%	+ 11%	+ 13%	+ 13%	+ 9%	+ 14%	+ 14%	+ 13%	12%	3,45
6	+ 1%	+ 7%	- 13%	- 18%	- 13%	- 15%	- 2%	- 3%	- 18%	- 23%	- 15%	19%	2,51
7	- 28%	- 20%	- 20%	- 19%	- 16%	- 17%	- 20%	- 17%	- 16%	- 19%	- 18%	15%	3,91
8	+ 2%	- 1%	- 4%	- 9%	- 8%	- 7%	- 7%	- 10%	- 10%	- 11%	- 9%	9%	3,13
9	+ 9%	+ 7%	- 1%	- 5%	- 8%	- 3%	- 8%	+ 1%	- 3%	- 10%	- 6%	8%	2,23
10	+ 11%	- 3%	+ 5%	+ 4%	+ 4%	+ 1%	+ 4%	+ 2%	+ 4%	+ 1%	+ 3%	3%	3,18
11	+ 6%	+ 11%	+ 19%	+ 12%	+ 14%	+ 16%	+ 18%	+ 18%	+ 21%	+ 18%	+ 17%	15%	3,57
12	- 10%	- 3%	- 3%	- 2%	- 5%	- 1%	- 6%	- 5%	- 1%	- 0%	- 2%	2%	3,59
13	- 6%	- 8%	- 8%	- 6%	- 5%	- 3%	- 1%	- 2%	- 2%	- 4%	- 4%	4%	3,31
14	- 6%	- 1%	- 3%	- 7%	- 6%	- 7%	- 7%	- 3%	- 5%	- 5%	- 5%	4%	3,81
15	- 18%	- 6%	- 8%	- 7%	- 5%	- 4%	- 6%	- 7%	- 5%	- 7%	- 6%	5%	3,67
16	+ 13%	+ 17%	+ 83%	+ 21%	+ 19%	+ 19%	+ 19%	+ 22%	+ 17%	+ 19%	+ 21%	14%	4,59
17	- 12%	- 17%	- 15%	- 12%	- 8%	- 7%	- 10%	- 14%	- 11%	- 8%	- 10%	8%	4,20
18	- 11%	- 11%	- 7%	- 8%	- 11%	- 9%	- 8%	- 6%	- 8%	- 11%	- 9%	8%	3,63
19	- 3%	- 12%	- 7%	- 8%	- 5%	- 7%	- 7%	- 1%	- 7%	- 5%	- 6%	5%	3,76
20	+ 13%	+ 22%	+ 30%	+ 21%	+ 22%	+ 16%	+ 18%	+ 14%	+ 21%	+ 19%	+ 20%	16%	3,84
21	+ 0%	- 6%	- 2%	+ 1%	+ 2%	+ 1%	- 3%	- 1%	- 1%	+ 0%	- 0%	2%	0,73
22	+ 26%	+ 25%	+ 26%	+ 22%	+ 28%	+ 21%	+ 23%	+ 27%	+ 18%	+ 22%	+ 22%	16%	4,26
23	+ 8%	+ 11%	+ 17%	+ 15%	+ 13%	+ 15%	+ 15%	+ 17%	+ 17%	+ 15%	+ 15%	13%	3,76
24	- 6%	- 9%	- 6%	- 8%	- 9%	- 10%	- 12%	- 8%	- 9%	- 9%	- 9%	7%	3,91
25	- 17%	- 6%	- 11%	- 17%	- 13%	- 13%	- 16%	- 4%	- 19%	- 23%	- 17%	18%	2,97
26	- 12%	- 6%	- 1%	- 7%	- 6%	- 6%	- 8%	- 7%	- 8%	- 6%	- 7%	6%	3,68
27	+ 28%	+ 11%	+ 17%	+ 22%	+ 19%	+ 17%	+ 17%	+ 17%	+ 20%	+ 22%	+ 20%	18%	3,53
28	+ 25%	+ 4%	- 0%	- 14%	- 13%	- 11%	- 13%	- 8%	- 13%	- 13%	- 12%	12%	3,04
29	- 7%	- 0%	- 6%	- 11%	- 12%	- 10%	- 8%	- 10%	- 9%	- 9%	- 9%	3%	8,79
30	+ 11%	+ 33%	+ 8%	+ 15%	+ 11%	+ 8%	+ 7%	- 0%	+ 3%	+ 5%	+ 8%	9%	2,61
31	- 7%	- 1%	- 7%	- 3%	- 0%	- 2%	- 0%	- 1%	+ 1%	- 2%	- 2%	3%	1,64
32	+ 3%	- 3%	+ 15%	+ 8%	+ 9%	+ 5%	+ 8%	+ 1%	+ 6%	+ 11%	+ 8%	5%	4,68
33	+ 13%	+ 3%	+ 7%	+ 9%	+ 10%	+ 4%	+ 10%	+ 9%	+ 6%	+ 8%	+ 8%	3%	8,08
34	+ 9%	+ 16%	+ 13%	+ 20%	+ 16%	+ 19%	+ 15%	+ 20%	+ 18%	+ 19%	+ 18%	3%	16,51
35	- 5%	- 8%	- 7%	- 8%	- 8%	- 7%	- 10%	- 8%	- 9%	- 8%	- 8%	2%	17,44
d	+ 0%	+ 1%	+ 0%	- 1%	- 0%	- 0%	- 1%	+ 0%	- 1%	- 1%	- 0%	13%	
Sd	13%	12%	12%	13%	12%	11%	12%	11%	12%	13%			

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

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

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

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

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

ZS calculated on the PT standard deviation

Sample Lab code	1	2	3	4	5	6	7	8	9	10
1	-1,16	-0,97	-1,19	-0,57	-0,83	-0,49	-0,75	-0,95	-1,15	-0,46
2	-1,31	-1,49	-1,32	-1,41	-1,44	-1,59	-1,43	-1,47	-1,35	-1,23
3	+0,62	+0,16	+0,15	-0,34	-0,14	-0,46	-0,54	-0,29	-0,53	-0,29
4	-0,05	-0,36	-0,05	-0,15	-0,29	-0,25	-0,16	-0,27	-0,01	-0,07
5	-0,12	+0,55	+0,94	+0,95	+0,93	+1,12	+1,09	+0,76	+1,14	+1,08
6	+0,10	+0,55	-1,07	-1,41	-1,05	-1,37	-0,17	-0,29	-1,45	-1,80
7	-2,13	-1,62	-1,64	-1,51	-1,30	-1,56	-1,68	-1,49	-1,27	-1,48
8	+0,17	-0,10	-0,35	-0,68	-0,64	-0,59	-0,58	-0,85	-0,81	-0,82
9	+0,69	+0,55	-0,08	-0,37	-0,65	-0,31	-0,66	+0,10	-0,25	-0,80
10	+0,84	-0,23	+0,37	+0,35	+0,32	+0,13	+0,34	+0,18	+0,32	+0,06
11	+0,47	+0,90	+1,51	+0,94	+1,19	+1,43	+1,57	+1,56	+1,68	+1,37
12	-0,79	-0,27	-0,25	-0,18	-0,45	-0,06	-0,47	-0,41	-0,11	-0,02
13	-0,42	-0,62	-0,62	-0,50	-0,42	-0,26	-0,10	-0,18	-0,19	-0,31
14	-0,49	-0,06	-0,22	-0,54	-0,53	-0,61	-0,57	-0,27	-0,37	-0,35
15	-1,38	-0,45	-0,65	-0,58	-0,43	-0,36	-0,48	-0,65	-0,42	-0,57
16	+0,99	+1,38	+6,73	+1,61	+1,58	+1,68	+1,60	+1,94	+1,43	+1,44
17	-0,94	-1,40	-1,24	-0,92	-0,65	-0,64	-0,86	-1,25	-0,87	-0,64
18	-0,86	-0,88	-0,60	-0,65	-0,91	-0,82	-0,71	-0,55	-0,68	-0,84
19	-0,20	-1,01	-0,57	-0,66	-0,43	-0,66	-0,55	-0,13	-0,55	-0,37
20	+0,99	+1,77	+2,43	+1,67	+1,78	+1,47	+1,50	+1,21	+1,71	+1,49
21	+0,03	-0,49	-0,17	+0,08	+0,20	+0,08	-0,29	-0,06	-0,12	+0,01
22	+1,95	+2,07	+2,08	+1,72	+2,33	+1,91	+1,97	+2,38	+1,45	+1,73
23	+0,62	+0,90	+1,39	+1,16	+1,04	+1,31	+1,23	+1,51	+1,38	+1,18
24	-0,49	-0,75	-0,52	-0,65	-0,72	-0,88	-1,00	-0,72	-0,76	-0,67
25	-1,31	-0,49	-0,89	-1,36	-1,04	-1,12	-1,39	-0,34	-1,53	-1,74
26	-0,94	-0,49	-0,05	-0,57	-0,49	-0,50	-0,66	-0,58	-0,62	-0,45
27	+2,10	+0,90	+1,36	+1,69	+1,56	+1,50	+1,45	+1,52	+1,65	+1,71
28	+1,88	+0,29	-0,03	-1,11	-1,04	-1,00	-1,14	-0,69	-1,06	-1,01
29	-0,57	-0,01	-0,52	-0,88	-1,03	-0,87	-0,66	-0,90	-0,76	-0,70
30	+0,84	+2,72	+0,64	+1,19	+0,87	+0,74	+0,59	-0,04	+0,25	+0,37
31	-0,57	-0,06	-0,60	-0,25	-0,01	-0,19	-0,02	-0,10	+0,05	-0,16
32	+0,25	-0,23	+1,24	+0,63	+0,78	+0,45	+0,64	+0,06	+0,49	+0,84
33	+0,99	+0,20	+0,55	+0,68	+0,85	+0,39	+0,82	+0,83	+0,52	+0,61
34	+0,69	+1,29	+1,04	+1,54	+1,33	+1,68	+1,30	+1,77	+1,51	+1,49
35	-0,35	-0,67	-0,55	-0,61	-0,65	-0,66	-0,88	-0,74	-0,75	-0,63

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

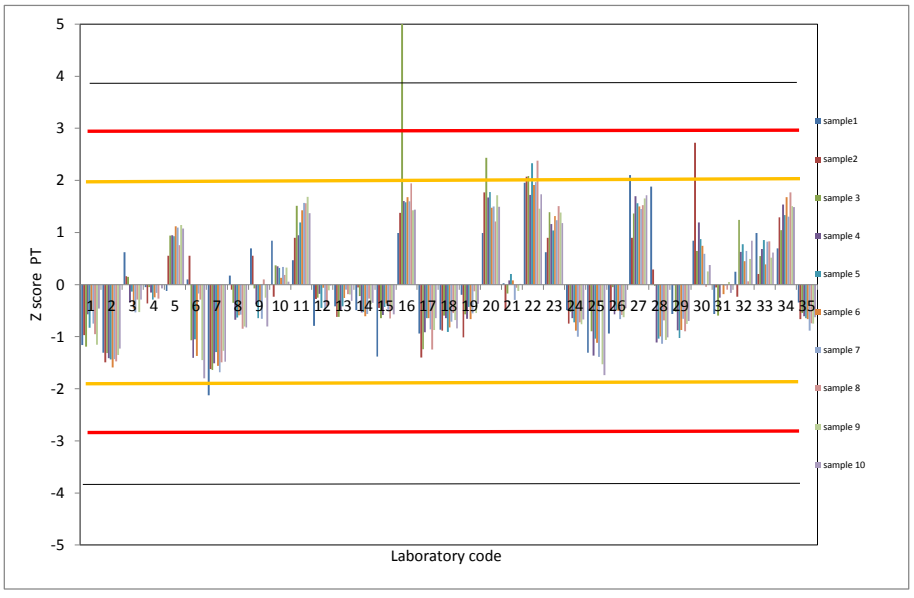


Table VII : **Zscore of the different laboratories for each sample.**

ZS calculated on the standard deviation of reproducibility of the method

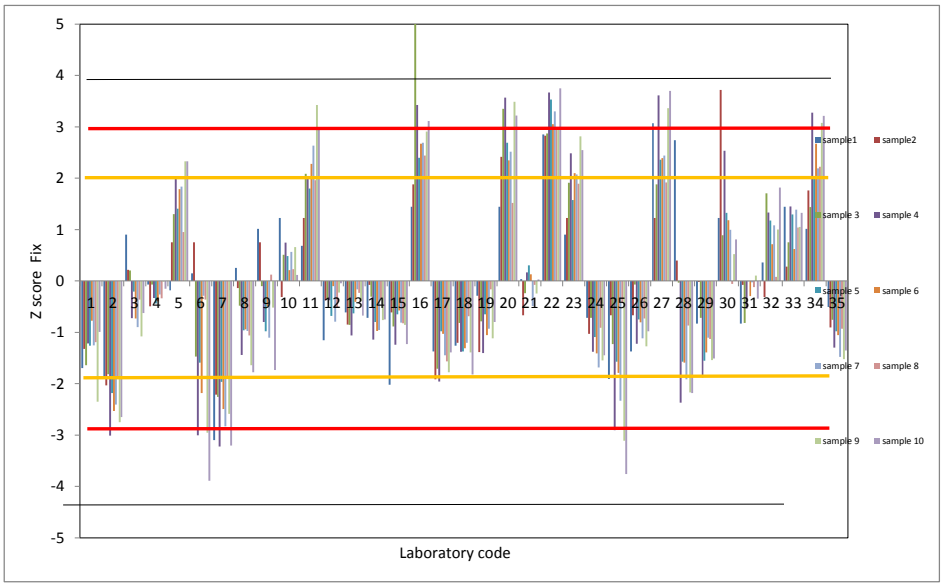
Sample/Lab code	1	2	3	4	5	6	7	8	9	10
1	-1,69	-1,32	-1,64	-1,22	-1,26	-0,77	-1,26	-1,19	-2,35	-0,99
2	-1,91	-2,04	-1,81	-3,01	-2,18	-2,53	-2,41	-1,85	-2,75	-2,65
3	+0,90	+0,22	+0,20	-0,73	-0,21	-0,73	-0,90	-0,36	-1,08	-0,63
4	-0,07	-0,49	-0,07	-0,33	-0,44	-0,39	-0,26	-0,34	-0,02	-0,15
5	-0,18	+0,75	+1,30	+2,02	+1,41	+1,79	+1,84	+0,95	+2,33	+2,33
6	+0,15	+0,75	-1,47	-3,01	-1,59	-2,18	-0,29	-0,36	-2,96	-3,89
7	-3,10	-2,21	-2,26	-3,22	-1,97	-2,49	-2,83	-1,87	-2,59	-3,20
8	+0,25	-0,14	-0,48	-1,44	-0,96	-0,94	-0,98	-1,06	-1,64	-1,78
9	+1,01	+0,75	-0,10	-0,80	-0,98	-0,49	-1,10	+0,12	-0,52	-1,74
10	+1,23	-0,32	+0,51	+0,75	+0,49	+0,21	+0,57	+0,23	+0,66	+0,12
11	+0,69	+1,23	+2,08	+2,01	+1,80	+2,28	+2,64	+1,96	+3,43	+2,96
12	-1,15	-0,37	-0,34	-0,37	-0,68	-0,10	-0,79	-0,51	-0,23	-0,04
13	-0,61	-0,85	-0,86	-1,06	-0,63	-0,41	-0,17	-0,23	-0,39	-0,67
14	-0,72	-0,08	-0,31	-1,14	-0,80	-0,97	-0,95	-0,34	-0,76	-0,75
15	-2,02	-0,61	-0,89	-1,24	-0,65	-0,58	-0,81	-0,82	-0,86	-1,23
16	+1,44	+1,88	+9,26	+3,42	+2,39	+2,67	+2,69	+2,44	+2,91	+3,11
17	-1,37	-1,92	-1,71	-1,96	-0,98	-1,03	-1,45	-1,57	-1,78	-1,39
18	-1,26	-1,20	-0,82	-1,38	-1,37	-1,31	-1,20	-0,69	-1,39	-1,82
19	-0,29	-1,38	-0,79	-1,40	-0,65	-1,06	-0,93	-0,16	-1,12	-0,80
20	+1,44	+2,41	+3,35	+3,57	+2,69	+2,35	+2,52	+1,52	+3,49	+3,22
21	+0,04	-0,67	-0,24	+0,17	+0,30	+0,13	-0,49	-0,08	-0,24	+0,03
22	+2,85	+2,83	+2,87	+3,67	+3,53	+3,05	+3,30	+2,99	+2,96	+3,75
23	+0,90	+1,23	+1,91	+2,48	+1,57	+2,10	+2,07	+1,89	+2,81	+2,55
24	-0,72	-1,03	-0,72	-1,38	-1,09	-1,41	-1,69	-0,91	-1,55	-1,45
25	-1,91	-0,67	-1,23	-2,91	-1,57	-1,79	-2,33	-0,43	-3,11	-3,76
26	-1,37	-0,67	-0,07	-1,22	-0,75	-0,80	-1,12	-0,73	-1,27	-0,98
27	+3,07	+1,23	+1,88	+3,61	+2,36	+2,39	+2,44	+1,92	+3,36	+3,70
28	+2,74	+0,40	-0,03	-2,37	-1,57	-1,59	-1,91	-0,87	-2,17	-2,19
29	-0,83	-0,02	-0,72	-1,88	-1,56	-1,39	-1,10	-1,13	-1,54	-1,51
30	+1,23	+3,72	+0,89	+2,54	+1,32	+1,18	+1,00	-0,06	+0,52	+0,81
31	-0,83	-0,08	-0,82	-0,54	-0,01	-0,30	-0,03	-0,12	+0,10	-0,34
32	+0,36	-0,32	+1,71	+1,33	+1,18	+0,72	+1,08	+0,08	+1,00	+1,82
33	+1,44	+0,28	+0,75	+1,45	+1,29	+0,62	+1,39	+1,04	+1,05	+1,33
34	+1,01	+1,76	+1,44	+3,28	+2,02	+2,67	+2,19	+2,22	+3,07	+3,22
35	-0,50	-0,91	-0,75	-1,30	-0,98	-1,06	-1,48	-0,93	-1,53	-1,35

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



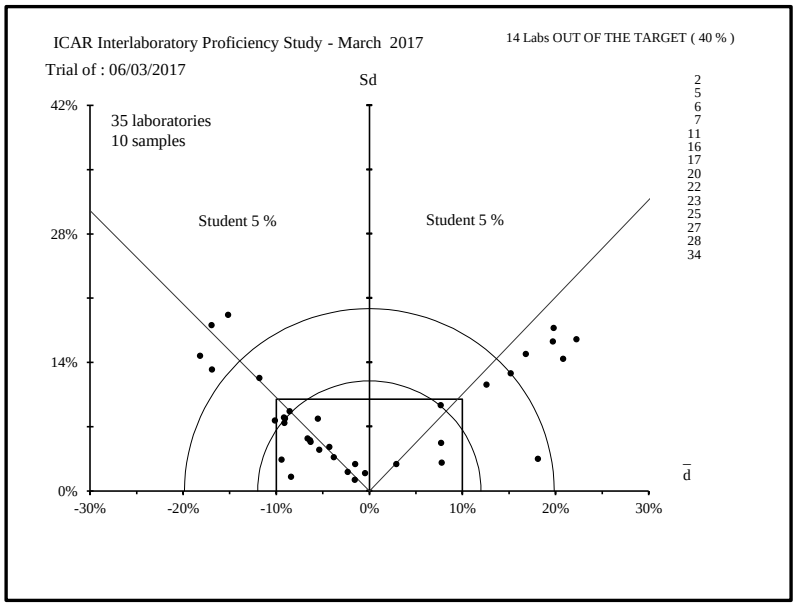


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF ICAR PARTICIPANTS

RAW MILK

SOMATIC CELL COUNT

MARCH 2017

Name	City	Country
ACTALIA	POLIGNY	FRANCE
AGROSCOPE	LIEBEFELD	SWITZERLAND
AIA-LABORATORIO STANDARD LATTE	MACCARESE	ITALY
BIOR INST.of FOOD SAFETY, ANIMAL HEALTH and ENVI	RIGA	LATVIA
CENTRAL MILK LABORATORY - ICBA	CAESAREA	ISRAEL
COOPRINSEM	OSORNO	CHILE
CROATIAN AGRICULTURAL AG. CENTRAL LAB.for Milk Q	KRIZEVCI	CROATIA
DELAVAL INT. AB	TUMBA	SWEDEN
EASTERN LAB SERVICES	MEDINA	USA
ESTONIAN LIVESTOCK PERFORMANCE RECORDING Ltd	TARTU	ESTONIA
EUROFINS STEINS LABORATORY A/S	JÖNKÖPING	SWEDEN
EUROFINS STEINS LABORATORY A/S	VEJEN	DENMARK
FED.LATTERIE SOCIALI DI BOLZANO	BOLZANO	ITALY
HOLSTEIN-RO BREEDERS ASS. LABORATORY	BUCHAREST	ROMANIA
LAB AGROAL DE SANTANDER	SANTANDER	SPAIN
LAB. POLJOPRIVREDNI	NOVI SAD	SERBIA
LOM KCHZ LABORATORIM REFERENCYJNE	PRUSZKOW	POLAND
MERIEUX NUTRISCIENCE	CAPE TOWN	SOUTH AFRICA
MERIEUX NUTRISCIENCE	MIDRAND	SOUTH AFRICA
MERIEUX NUTRISCIENCE J BAY	CAPE TOWN	SOUTH AFRICA
MILCHPRUFRING BADEN-WURTTEMBERG E.V.	KIRCHEIM / TECK	GERMANY
PFHBiPM LAB w Kobiernie	KOBIERNO	POLAND
PFHBiPM LAB w Parzniewie	PRUSZKOW	POLAND
PFHBiPM LAB. w Bialymstoku	TYKOCIN	POLAND
PFHBiPM Region Oceny Bydgoszcz z/s w Minikowie	MINIKOVO	POLAND
QLIP N.V.	CM ZUTPHEN	NETHERLAND
SHANGAI DAIRY BREEDING CENTER Co.Ltd	SHANGHAI	CHINA
TAIWAN LIVESTOCK RESEARCH INST.	HSINHUA	TAIWAN
THE CATTLE INFORMATION SERVICE	TELFORD	UNITED KINGDOM
UNIV OF LJUBLJANA	DOMZALE	SLOVENIA
VALACTA	STE ANNE DE BELLEVUE	CANADA