THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

ICAR PROFICIENCY TEST - SEPTEMBER 2017

Raw cow milk

Chemical “Reference” Methods

THE GLOBAL STANDARD
FOR LIVESTOCK DATA

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FRAME OF ACTIVITY :

ICAR MILK ANALYSES SUB-COMMITTEE (MA SC)

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

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Table of contents

Introduction

Dear Participant,

Thank you for participating in the ICAR Proficiency Test (PT) September 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,H 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) It is the ranking of your laboratory. The values of table 1 for each parameter are reported. In table D the ranking of your lab will be green if the mean of difference and standard deviation of difference value are in the box of figure 2 of each parameter. Limits are only indicative and so far do not constitute standard values; they indicate what is normally reachable by labs for their self evaluation. According the results obtained the MA SC will decide eventually to revise. During the meeting of Milk Analyses Sub Committee held in Copenhagen in June 2016 the experts decided to update the limit of the box to evaluate the accuracy.

E) Here are reported the samples that resulted outlier for your participation code for Grubbs or Cochran test

F) The evaluation of repeatability of the results should be one of the first controls before communication of the data. In table F the absolute difference between replicates is compared with the repeatability limit of the relevant "reference" method indicated. If one or more results have a result out of the limit, the cell is in red. It may be that you have deployed a chemical method that is different from the reference method indicated. If the repeatability is bigger it will be evaluated internally with the precision of the specific method used. You can

find all the detailed information of your data in Table II in the section Statistical elaboration for each parameter.

G) In table G the results of your Z-Score$_{PT}$ (standard deviation calculated on this proficiency test) and the Z-Score$_{FIX}$ (standard deviation of the reference method) are summarized. If you have obtained all the -2<Z-Score results<+2 the cell will be filled in green. If you have obtained one or more results in the moderate or poor performance range the cells will be filled in yellow or red respectively.

H) Your ZS Control Charts have been updated with data of the previous ICAR PT if you have participated. On the control charts the samples are ordered by concentration.

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

In the second part of the report the statistical elaboration followed the template approved by ICAR's Milk Analyses Sub Committee chaired by Dr. Gavin Scott (NZ). You find the statistical elaboration for all the ICAR interested parameters, fat, protein, lactose, urea and somatic cell.

We think it is important to show you, as ICAR member, the reproducibility of the ICAR laboratories, even if you have not participated in this PT round.

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

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

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

The list of all ICAR reference laboratories and those participated in ICAR PT in September 2017 with at least one parameter is reported below and also available in ICAR website at:

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

Name of the laboratory	Country
Comité du Lait ASBL	Belgium
Department Valorisation des productions Agricoles	Belgium
ILVO	Belgium
Can West	Canada
Central Milk Testing Lab	Canada
Horizon Lab Ltd	Canada
Pacific Milk Analysis	Canada
Valacta - Centre d'Expertise en Production Laitière du Québec	Canada
COOPRINSEM	Chile
Dairy Cattle Research Center of Shandong Academy of Agricultural Sciences	China
Shangai Dairy Breeding Center Co. Ltd	China
Croatian Agricultural Agency, Central Laboratory for Milk Quality Control	Croatia
University of Zagreb Faculty of Agriculture Dept. of Dairy Science	Croatia
Laborator pro rozbor mléka Brno, Ceskomoravská spolecnost chovatelú a.s.	Czech Republic
Laborator pro rozbor mléka Bustehrad, Ceskomoravská spolecnost chovatelú a.s.	Czech Republic
Milkom a.s Dairy research institute	Czech Republic
The National laboratory for raw milk Agrovyzkum Rapotin s.r.o.	Czech Republic
ChemoMetec A/S	Denmark
Eurofins Steins Laboratory A/S	Denmark

Name of the laboratory	Country
Cattle Information Service (CIS)	England
Osuuskunta Satamaito, laboratorio	Finland
Valio Oy/Seinajoen aluelaboratorio	Finland
Actalia	France
Milchprüfring Baden-Württemberg e.V.	Germany
Teagasc Food research Center	Ireland
Central Milk Lab ICBA	Israel
Laboratorio Standard Latte	Italy
Japan Dairy Technical Association	Japan
Pieno Tyrimai	Lithuania
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Poland
Alip	Portugal
LRV-Laboratorio Regional de Veterinaria	Portugal
Holstein-Ro Breeders Association Laboratory	Romania
Laboratorija za ispitivanje kvaliteta mleka, Poljoprivredni fakultet Novi Sad	Serbia
Deltamune	South Africa
Merieux Nutriscience South Africa	South Africa
University of Pretoria, Faculty Vet Sciences, Dept. Production Animal Studies Milk Lab. Onderstepoort	South Africa
Lab Agroalimentario de Santander	Spain
LIGAL Edificio de Laboratorio Agrarios	Spain
Eurofins Steins Laboratory A/B	Sweden
Agroscope Institute for food Sciences IFS	Switzerland
Suisselab AG	Switzerland
Taiwan Livestock research Insitute	Taiwan
Qlip B.V.,	The Netherlands
Direction de l' Amelioration Genetique	Tunisia
Eastern Lab services	USA
Vetlab Agricultural Showgrouds	Zambia

Attached to this report you find the certificate of your participation in the ICAR PT.-

ICAR would like to stay at your side to support you in any way we can to help improve overall quality management systems for milk analyses. Your active participation in the ICAR PTs and in the Milk Analyses meetings is encouraging. We welcome any and all feedback/comments you may have on this activity, as it will help us continuously improve and to ultimately provide you a better service.

Kind Regards,

ICAR Secretariat

THE GLOBAL STANDARD FOR LIVESTOCK DATA

Chemical Reference Methods
Laboratory participation codes and Performance analyses

ICAR PT RF0917

Laboratory Name	

A — Your participation Codes

	Fat$_{ref}$	Protein$_{ref}$	Lactose$_{ref}$	Urea$_{ref}$	SCC$_{ref/alt}$
Subscription	Yes	Yes	Yes	Yes	Yes
Participation Codes	5	5	4	3	4
Are all the sample results received?	Yes	Yes	Yes	Yes	Yes

B — Data results received on time

No	18-09-2017

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

	Fat$_{ref}$	Protein*$_{ref}$	Lactose$_{ref}$	Urea$_{ref}$	SCC$_{ref/alt}$
	g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
	Yes	Yes	Yes	Yes	Yes

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

D — Ranking of your lab

	Fat$_{ref}$	Protein*$_{ref}$	Lactose$_{ref}$	Urea$_{ref}$	SCC$_{ref/alt}$
	g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
Code	5	5	4	3	4
%	69	69	80	60	45%
d	-0.001	0.012	0.059	1.231	-14%
Sd	0.019	0.020	0.098	0.392	11%
D	0.019	0.023	0.115	1.292	18%
Method	ISO 1211|IDF 1	ISO8968|IDF20	ISO26642|IDF214	ISO14637|IDF195	ISO13366-2|IDF148-2
			Limits		
d	0,020	0,025	0,10	2,5	10%
Sd	0,030	0,020	0,10	1,5	10%

E — Outliers

	Fat$_{ref}$	Protein*$_{ref}$	Lactose$_{ref}$	Urea$_{ref}$	SCC$_{ref/alt}$
	g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
Sample 1		Cochran	Cochran		
Sample 2			Cochran		
Sample 3		Cochran			
Sample 4		Cochran			
Sample 5		Cochran			
Sample 6					
Sample 7					
Sample 8					
Sample 9					
Sample 10					

F

Repeatability

Your "r" performance

	Fat	Protein	Lactose	Urea	SCC
	g/100g	nitrogen g/100g	g/100g	mg/dl	SCC*1000/ml
Sample 1	0.010	0.070	0.077	0.660	2
Sample 2	0.010	0.007	0.056	0.430	19
Sample 3	0.010	0.049	0.003	0.030	20
Sample 4	0.010	0.085	0.016	0.160	2
Sample 5	0.010	0.073	0.021	0.690	11
Sample 6	0.000	0.021	0.012	0.070	42
Sample 7	0.010	0.002	0.023	0.730	0.000
Sample 8	0.010	0.031	0.025	1.320	1
Sample 9	0.010	0.021	0.038	0.520	3
Sample 10	0.020	0.004	0.013	0.330	4

If the repeatability in smaller than the limit the cell is in green if there is a sample with a "r" bigger than the limit the cell is in red. Please check table II in correspondence of the parameter and your lab code.

Limits

Fat	Protein	Lactose	Urea	SCC	
g/100g	g/100g	g/100g	mg/dl	SCC*1000/ml	
ISO 1211 IDF 1D	ISO 8968 IDF 20	ISO 22662 IDF 198	ISO 14637 IDF 195	ISO 13366-2 IDF 148-2	
0,043	0,038	0,06	1,52	Level	r
				150	25
				300	42
				450	51
				750	64
				1500	126

G

Your Z-Score PT

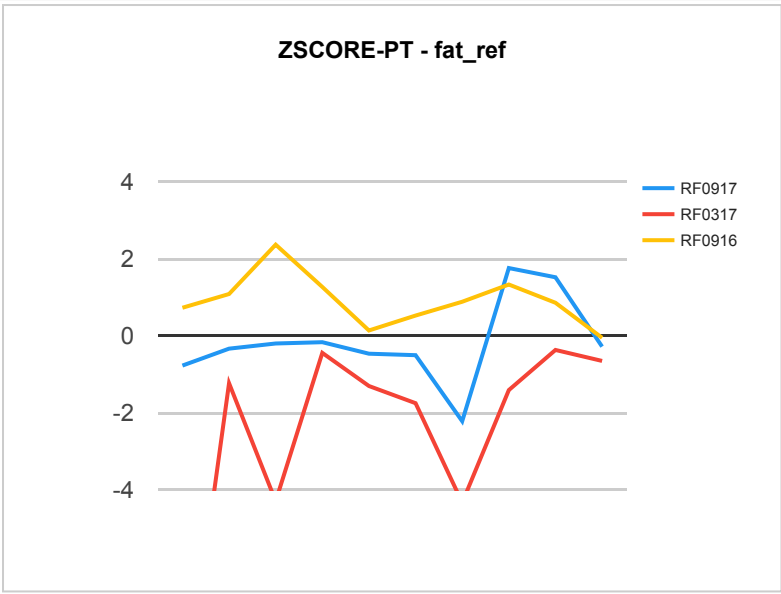
	Fat	Protein	Lactose	Urea	SCC
Sample 1	-0.294	0.223	-1.127	1.367	-0.90
Sample 2	1.745	-1.234	-1.139	1.380	-0.56
Sample 3	-0.517	2.406	0.456	1.290	-0.73
Sample 4	-0.180	1.474	1.162	0.970	-0.62
Sample 5	-0.348	1.937	0.668	0.559	-0.62
Sample 6	1.505	0.477	1.595	1.052	-0.69
Sample 7	-2.230	0.223	1.824	0.971	-0.55
Sample 8	-0.478	0.022	0.873	1.242	-0.55
Sample 9	-0.786	-0.043	1.264	1.270	-0.79
Sample 10	-0.213	0.997	2.400	1.900	-0.68

Your Z-Score Fix

	Fat	Protein	Lactose	Urea	SCC
Sample 1	-0.117	0.267	-1.250	0.912	-2.26
Sample 2	2.022	-1.333	-3.545	0.786	-1.95
Sample 3	-0.182	2.588	0.992	0.673	-1.96
Sample 4	-0.100	1.440	1.493	0.907	-1.65
Sample 5	-0.175	1.796	1.695	0.324	-1.87
Sample 6	0.729	0.437	2.620	0.814	-2.34
Sample 7	-1.711	0.190	2.686	0.404	-1.79
Sample 8	-0.268	0.034	2.600	0.880	-2.15
Sample 9	-0.411	-0.074	2.444	0.474	-2.08
Sample 10	-0.180	1.122	2.825	0.628	-2.35

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

Interpretation Z-Score				
Z-Score<-3	-3<Z-Score<-2	-2<Z-Score<2	2<Z-Score<3	Z-Score>3
Poor	Moderate	Good	Moderate	Poor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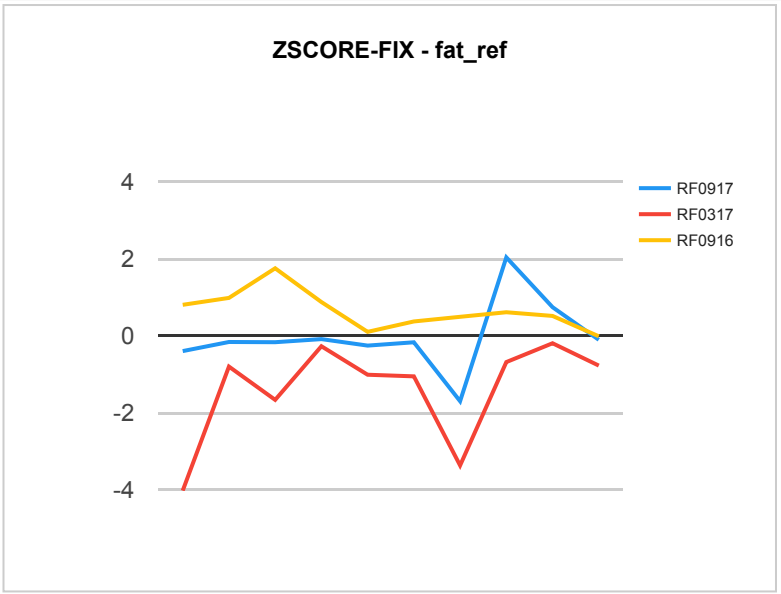
2
0
-2
-4
RF0917
RF0317
RF0916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-4
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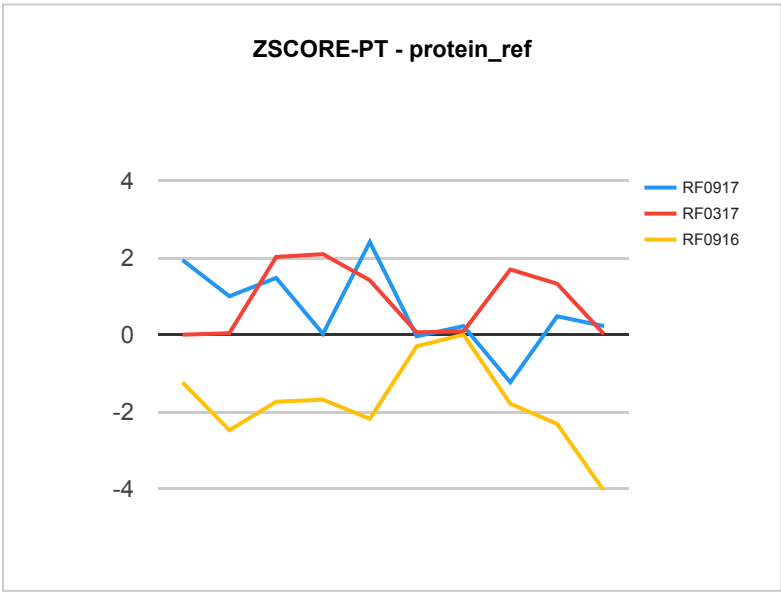
RF0916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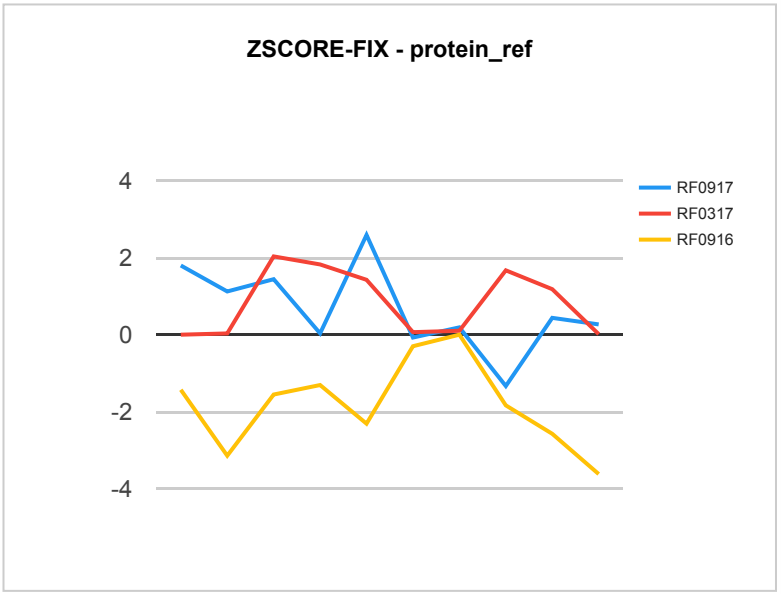
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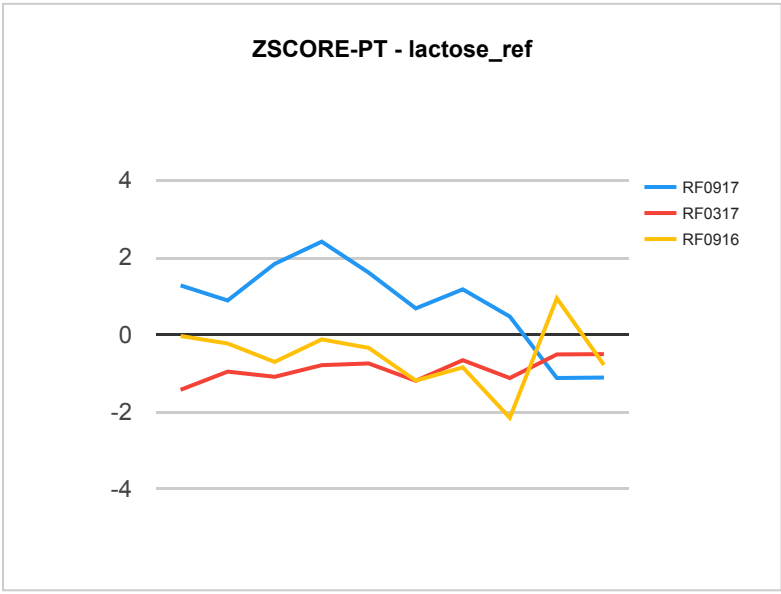
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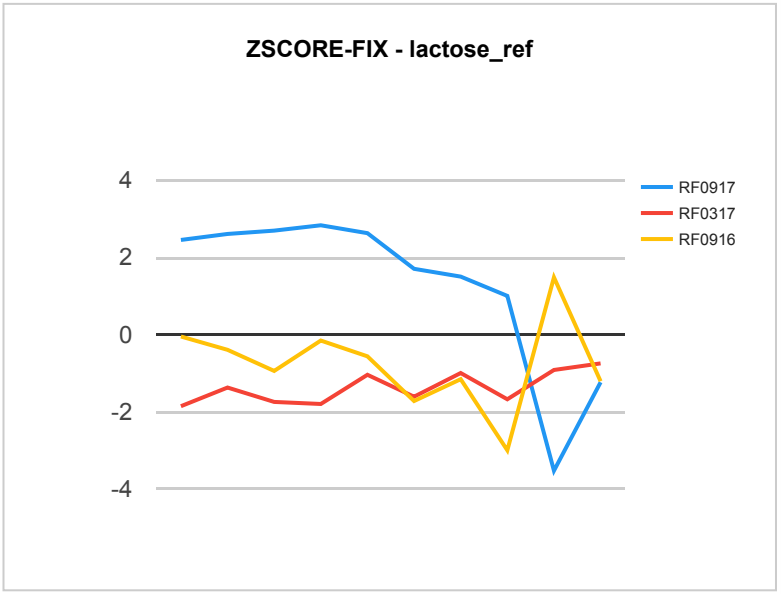
-4
RF0917
RF0317
RF0916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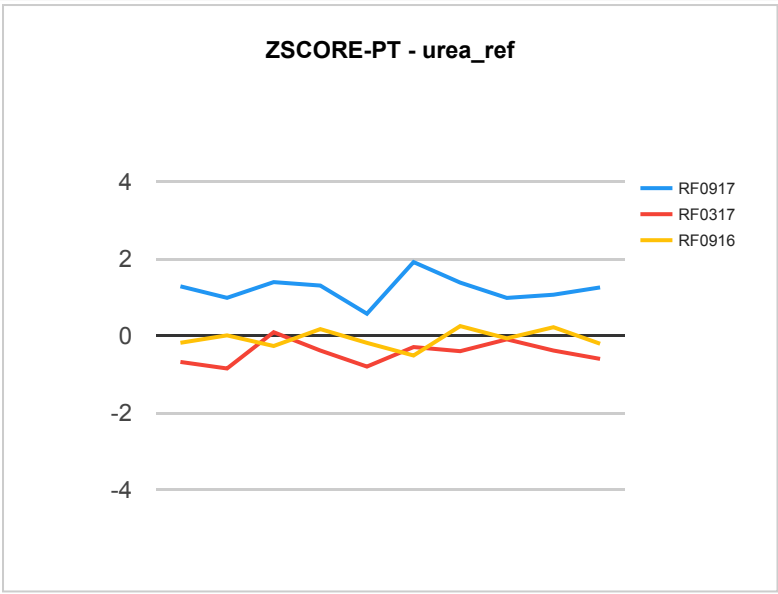
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-4
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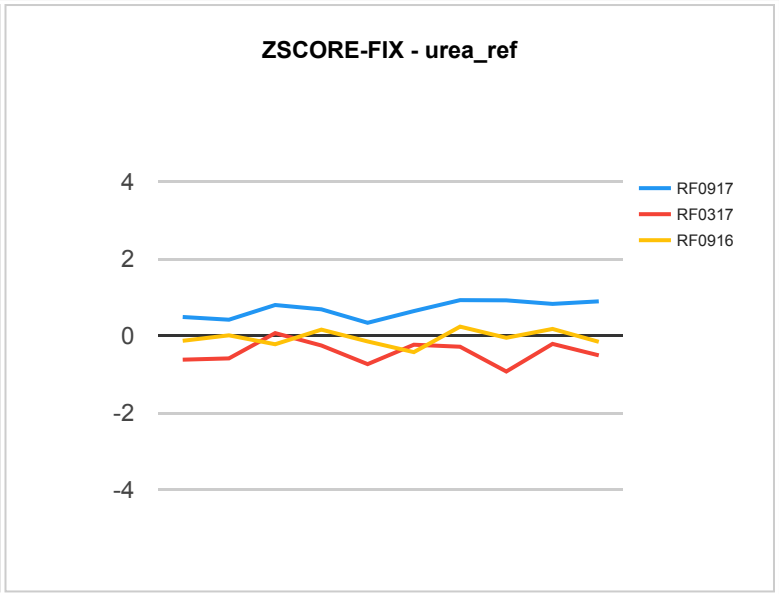
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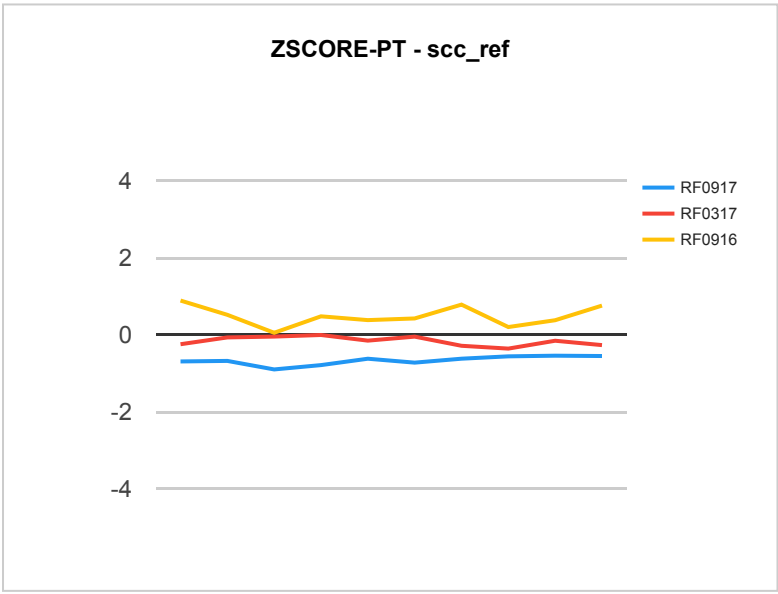
RF0916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-2
-4
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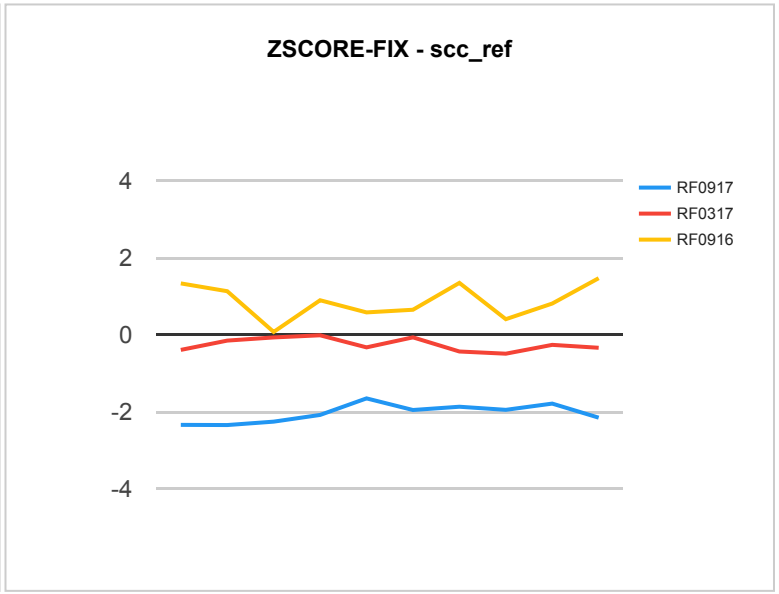

ZSCORE-FIX - scc_ref
4
2
0
-2
-4
RF0917
RF0317
RF0916

ICAR
PROFICIENCY TESTING SCHEME

September 2017

Raw Milk

Determination of FAT CONTENT
Röse Gottlieb method

Sending date of statistical treatment : 9th October 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

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

Nb	%	N°	d	Sd	D	Method
1	6	12	- 0,000	0,004	0,004	A
2	13	11	- 0,001	0,005	0,005	A
3	19	15	+ 0,003	0,004	0,005	A
4	25	2	+ 0,002	0,005	0,005	A
5	31	9	- 0,003	0,005	0,006	A
6	38	14	- 0,002	0,006	0,006	A
7	44	13	- 0,003	0,008	0,009	A
8	50	3	+ 0,009	0,004	0,010	A
9	56	10	- 0,002	0,011	0,011	A
10	63	8	+ 0,007	0,010	0,012	A
11	69	5	- 0,001	0,019	0,019	A
12	75	6	- 0,006	0,021	0,022	B
13	81	4	- 0,026	0,031	0,041	A
14	88	16	- 0,037	0,023	0,044	A
15	94	7	+ 0,048	0,089	0,101	A
16	100	1	+ 0,059	0,159	0,170	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 16 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}	0,007
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	0,006	0,005	0,002	0,004	1,000 *	0,014	0,006	0,003	0,003	0,002	0,224	20
2	0,012	0,017	0,002	0,002	0,019	0,000	0,001	0,000	0,013	0,020	0,008	20
3	0,002	0,002	0,001	0,003	0,001	0,001	0,000	0,001	0,003	0,001	0,001	20
4	0,003	0,015	0,019	0,002	0,021	0,005	0,006	0,003	0,022	0,004	0,009	20
5	0,010	0,010	0,010	0,010	0,010	0,000	0,010	0,010	0,010	0,020	0,008	20
6	0,030	0,020	0,000	0,020	0,000	0,020	0,010	0,010	0,010	0,000	0,011	20
7	0,025	0,008	0,027	0,007	0,002	0,008	0,014	0,002	0,006	0,014	0,010	20
8	0,003	0,013	0,011	0,003	0,001	0,011	0,007	0,006	0,000	0,003	0,005	20
9	0,000	0,006	0,006	0,004	0,004	0,000	0,011	0,001	0,000	0,001	0,003	20
10	**	**	**	0,013	0,011	0,009	0,002	0,015	0,012	0,004	0,007	14
11	0,013	0,012	0,018	0,002	0,007	0,010	0,006	0,003	0,013	0,000	0,007	20
12	0,000	0,003	0,001	0,001	0,010	0,016	0,013	0,013	0,006	0,007	0,006	20
13	0,014	0,013	0,006	0,010	0,006	0,014	0,007	0,007	0,000	0,005	0,007	20
14	0,005	0,005	0,006	0,006	0,002	0,003	0,006	0,002	0,002	0,005	0,003	20
15	0,008	**	0,000	0,008	0,003	0,000	0,011	0,010	0,002	0,013	0,005	18
16	0,046 *	0,021	0,010	0,017	0,007	0,019	0,004	0,003	0,008	0,012	0,013	20
Sr	0,012	0,009	0,008	0,006	0,177	0,008	0,006	0,005	0,006	0,007		312
NE	30	28	30	32	32	32	32	32	32	32		
L	0,033	0,032	0,030	0,024	0,025	0,029	0,022	0,019	0,025	0,026		

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	4,742	4,123	3,480	2,750	2,640 k	4,459	3,752	3,091	1,501	2,456
2	4,757	4,113	3,466	2,737	2,137	4,465	3,737	3,080	1,473	2,455
3	4,760	4,120	3,477	2,746	2,138	4,471	3,746	3,091	1,486	2,456
4	4,739	4,080	3,467	2,724	2,120	4,356 *	3,720	3,053	1,471	2,407
5	4,755	4,145	3,465	2,735	2,125	4,480	3,705	3,075	1,465	2,440
6	4,725 *	4,090	3,480	2,710	2,120	4,460	3,775	3,095	1,455	2,430
7	5,038 *	4,218 *	3,500 *	2,745	2,151	4,463	3,738	3,083	1,473	2,469
8	4,761	4,099	3,458	2,751	2,142	4,487	3,745	3,092	1,484	2,450
9	4,762	4,106	3,470	2,740	2,124	4,463	3,730	3,080	1,464	2,435
10				2,733	2,121	4,451	3,752	3,069	1,471	2,457
11	4,761	4,115	3,466	2,739	2,129	4,458	3,736	3,079	1,469	2,439
12	4,762	4,105	3,463	2,737	2,128	4,460	3,740	3,078	1,479	2,446
13	4,758	4,104	3,471	2,721	2,119	4,477	3,745	3,068	1,469	2,438
14	4,753	4,098	3,460	2,734	2,119	4,468	3,739	3,089	1,476	2,448
15	4,763		3,471	2,744	2,137	4,462	3,744	3,085	1,479	2,441
16	4,682 *	4,048	3,426 *	2,681 *	2,091 k	4,424 *	3,727	3,070	1,468	2,407
M	4,756	4,103	3,469	2,736	2,129	4,466	3,739	3,080	1,474	2,442
REF.	4,757	4,105	3,469	2,737	2,128	4,465	3,739	3,080	1,473	2,444
SD	0,008	0,023	0,007	0,011	0,010	0,010	0,015	0,011	0,010	0,017

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 16 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	16				1					
Outlier Grubbs	6; 7; 16	7	7; 16	7; 16	16	4; 16				
sr	0,006	0,009	0,006	0,006	0,007	0,007	0,006	0,005	0,006	0,007
SR	0,009	0,024	0,008	0,012	0,011	0,011	0,016	0,012	0,011	0,018

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	- 0,015	+ 0,018	+ 0,011	+ 0,013	+ 0,512	- 0,006	+ 0,013	+ 0,010	+ 0,027	+ 0,012	+ 0,059	0,159	1,18
2	- 0,000	+ 0,008	- 0,003	+ 0,000	+ 0,008	- 0,000	- 0,003	- 0,000	- 0,001	+ 0,011	+ 0,002	0,005	1,25
3	+ 0,003	+ 0,015	+ 0,008	+ 0,009	+ 0,009	+ 0,005	+ 0,007	+ 0,010	+ 0,012	+ 0,012	+ 0,009	0,004	7,64
4	- 0,019	- 0,025	- 0,002	- 0,013	- 0,009	- 0,110	- 0,019	- 0,028	- 0,002	- 0,037	- 0,026	0,031	2,66
5	- 0,002	+ 0,040	- 0,004	- 0,002	- 0,003	+ 0,015	- 0,034	- 0,005	- 0,008	- 0,004	- 0,001	0,019	0,13
6	- 0,032	- 0,015	+ 0,011	- 0,027	- 0,008	- 0,005	+ 0,036	+ 0,015	- 0,018	- 0,014	- 0,006	0,021	0,88
7	+ 0,280	+ 0,113	+ 0,031	+ 0,008	+ 0,023	- 0,002	- 0,001	+ 0,003	- 0,000	+ 0,025	+ 0,048	0,089	1,71
8	+ 0,003	- 0,006	- 0,011	+ 0,014	+ 0,013	+ 0,021	+ 0,005	+ 0,012	+ 0,011	+ 0,006	+ 0,007	0,010	2,21
9	+ 0,005	+ 0,001	+ 0,001	+ 0,003	- 0,004	- 0,002	- 0,010	- 0,001	- 0,009	- 0,009	- 0,003	0,005	1,49
10				- 0,004	- 0,008	- 0,015	+ 0,013	- 0,012	- 0,002	+ 0,013	- 0,002	0,011	0,51
11	+ 0,003	+ 0,010	- 0,003	+ 0,002	+ 0,000	- 0,007	- 0,003	- 0,002	- 0,005	- 0,005	- 0,001	0,005	0,55
12	+ 0,004	+ 0,001	- 0,006	+ 0,000	- 0,001	- 0,005	+ 0,000	- 0,002	+ 0,005	+ 0,003	- 0,000	0,004	0,07
13	+ 0,001	- 0,001	+ 0,002	- 0,016	- 0,009	+ 0,012	+ 0,005	- 0,013	- 0,004	- 0,006	- 0,003	0,008	1,11
14	- 0,005	- 0,007	- 0,009	- 0,003	- 0,009	+ 0,002	- 0,000	+ 0,009	+ 0,003	+ 0,004	- 0,002	0,006	0,84
15	+ 0,006		+ 0,002	+ 0,007	+ 0,008	- 0,003	+ 0,004	+ 0,005	+ 0,006	- 0,003	+ 0,003	0,004	2,51
16	- 0,076	- 0,056	- 0,043	- 0,056	- 0,038	- 0,041	- 0,012	- 0,011	- 0,005	- 0,036	- 0,037	0,023	5,24
d	- 0,001	- 0,001	- 0,000	- 0,001	+ 0,001	+ 0,000	+ 0,000	- 0,001	+ 0,001	- 0,002	+ 0,003	0,051	
Sd	0,008	0,023	0,007	0,011	0,010	0,010	0,015	0,011	0,010	0,017	0,013		

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

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

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

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-1,93	+0,77	+1,61	+1,17	+50,93	-0,66	+0,83	+0,90	+2,61	+0,74
2	-0,04	+0,34	-0,37	+0,00	+0,80	-0,04	-0,18	-0,03	-0,07	+0,68
3	+0,33	+0,67	+1,11	+0,77	+0,90	+0,52	+0,44	+0,90	+1,18	+0,71
4	-2,37	-1,08	-0,30	-1,17	-0,90	-11,35	-1,25	-2,49	-0,21	-2,17
5	-0,29	+1,74	-0,52	-0,18	-0,35	+1,51	-2,23	-0,48	-0,79	-0,21
6	-4,07	-0,63	+1,61	-2,43	-0,85	-0,56	+2,33	+1,31	-1,74	-0,81
7	+35,25	+4,89	+4,38	+0,68	+2,24	-0,25	-0,08	+0,24	-0,02	+1,51
8	+0,40	-0,26	-1,58	+1,22	+1,30	+2,18	+0,34	+1,04	+1,03	+0,35
9	+0,59	+0,06	+0,19	+0,27	-0,45	-0,25	-0,63	-0,08	-0,88	-0,54
10				-0,41	-0,80	-1,54	+0,83	-1,06	-0,21	+0,79
11	+0,40	+0,45	-0,37	+0,18	+0,00	-0,77	-0,21	-0,17	-0,45	-0,27
12	+0,56	+0,03	-0,82	+0,01	-0,08	-0,55	+0,02	-0,21	+0,51	+0,16
13	+0,08	-0,05	+0,33	-1,44	-0,94	+1,20	+0,34	-1,15	-0,40	-0,36
14	-0,61	-0,30	-1,23	-0,27	-0,94	+0,21	-0,01	+0,77	+0,27	+0,23
15	+0,71		+0,33	+0,63	+0,80	-0,35	+0,28	+0,41	+0,55	-0,18
16	-9,51	-2,43	-6,04	-5,03	-3,74	-4,26	-0,80	-0,95	-0,50	-2,15

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

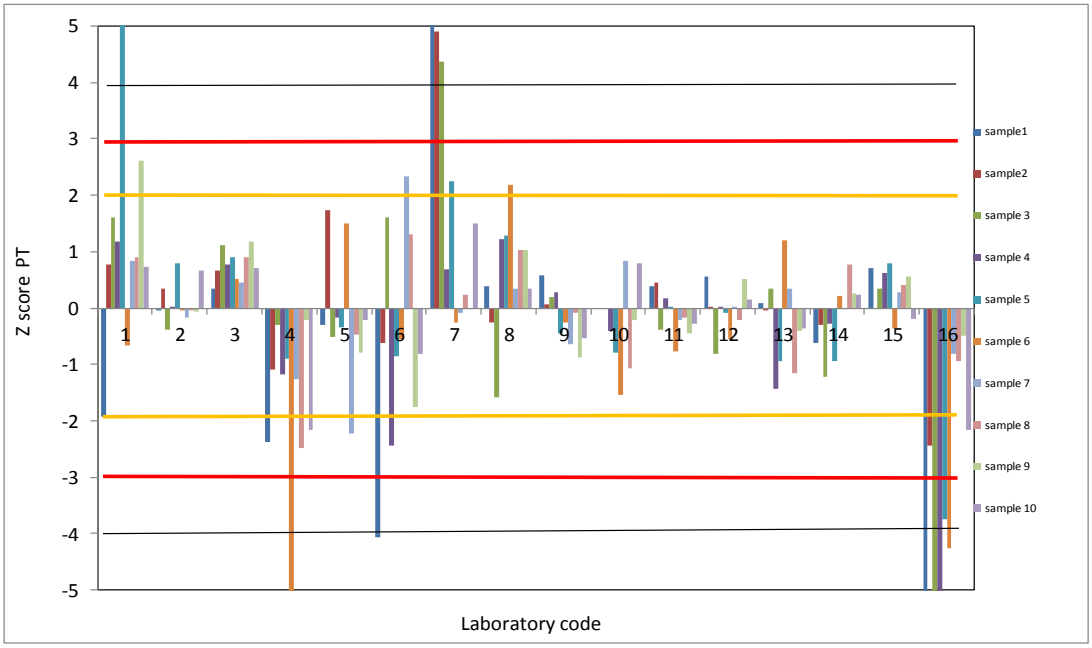


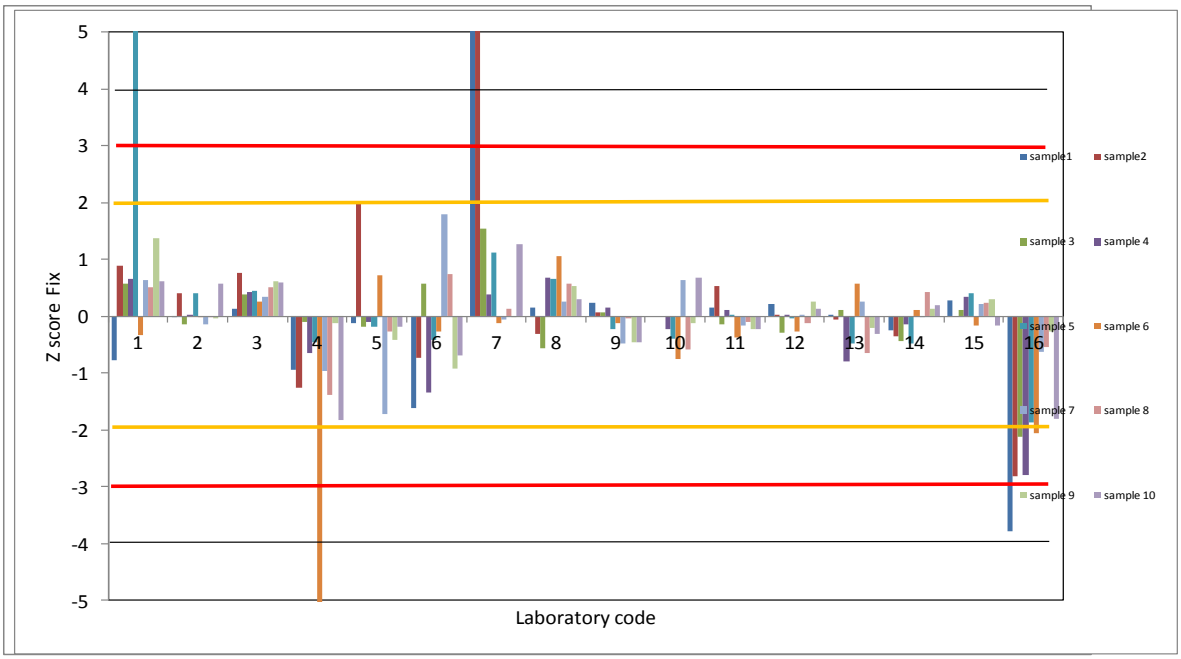
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	-0,77	+0,90	+0,57	+0,65	+25,58	-0,32	+0,64	+0,51	+1,36	+0,62
2	-0,02	+0,40	-0,13	+0,00	+0,40	-0,02	-0,14	-0,02	-0,04	+0,57
3	+0,13	+0,77	+0,39	+0,43	+0,45	+0,25	+0,34	+0,51	+0,61	+0,60
4	-0,94	-1,25	-0,11	-0,65	-0,45	-5,50	-0,96	-1,39	-0,11	-1,83
5	-0,12	+2,02	-0,18	-0,10	-0,17	+0,73	-1,71	-0,27	-0,41	-0,18
6	-1,62	-0,73	+0,57	-1,35	-0,42	-0,27	+1,79	+0,73	-0,91	-0,68
7	+14,01	+5,67	+1,54	+0,38	+1,13	-0,12	-0,06	+0,13	-0,01	+1,27
8	+0,16	-0,30	-0,56	+0,68	+0,65	+1,05	+0,26	+0,58	+0,54	+0,30
9	+0,23	+0,07	+0,07	+0,15	-0,22	-0,12	-0,49	-0,04	-0,46	-0,45
10				-0,22	-0,40	-0,75	+0,64	-0,59	-0,11	+0,67
11	+0,16	+0,52	-0,13	+0,10	+0,00	-0,37	-0,16	-0,09	-0,24	-0,23
12	+0,22	+0,03	-0,29	+0,00	-0,04	-0,27	+0,02	-0,12	+0,26	+0,14
13	+0,03	-0,05	+0,12	-0,80	-0,47	+0,58	+0,26	-0,64	-0,21	-0,30
14	-0,24	-0,35	-0,43	-0,15	-0,47	+0,10	-0,01	+0,43	+0,14	+0,20
15	+0,28		+0,12	+0,35	+0,40	-0,17	+0,21	+0,23	+0,29	-0,15
16	-3,78	-2,81	-2,13	-2,79	-1,88	-2,06	-0,62	-0,53	-0,26	-1,81

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



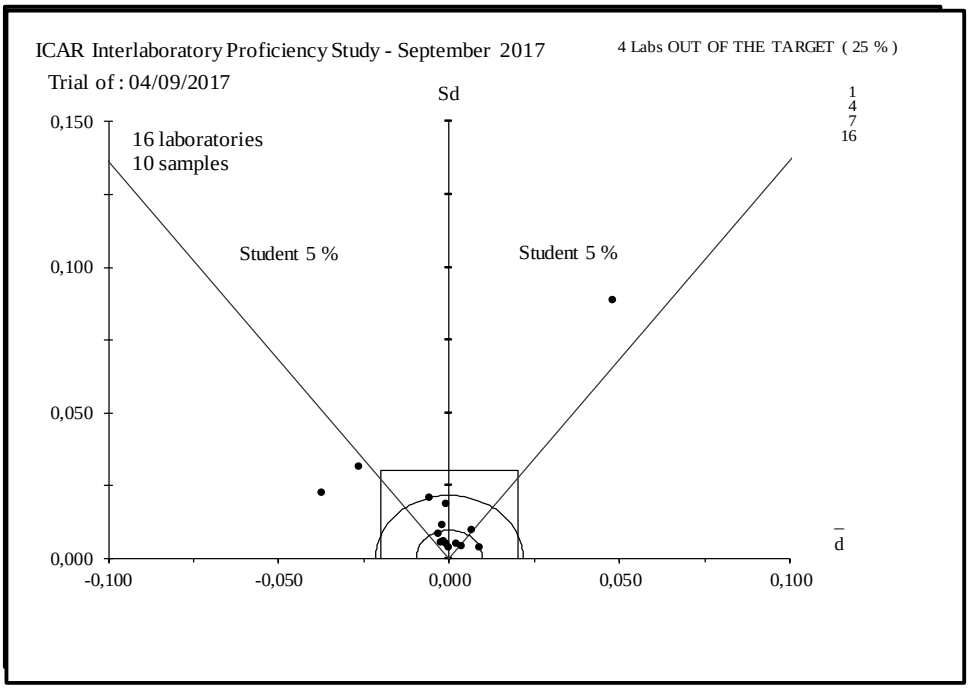


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
FAT CONTENT Röse Göttlieb
September 2017

Name	City	Country
Actalia	Poligny	France
Agroscope	3003 Bern-Liebefeld	Switzerland
Central Milk Lab ICBA	Caesarea	IL
Department Valorisation des productions Agricoles	Gembloux	Belgium
Eastern Lab services	Medina	USA
ILVO	Melle	Belgium
Japan Dairy Technical Association	Tokyo	Japan
Lab Agroalimentario de Santander	Santander Cantabria	Spain
Laboratorio Standard Latte	Maccarese	Italy
Laboratorium Oceny Mleka KCHZ Parzniewie	Pruszkow	Poland
Milchprüfring Baden-Württemberg e.V.	Kirchheim unter Teck	Germany
Pieno Tyrimai	Kaunas	Lithuania
Qlip B.V.,	Zutphen	NL
Teagasc Food research Center	Cork	IR
Nat. Lab. for raw milk Agrovyzkum Rapotin s.r.o.	Vikyrovice	Czech Republic
Valacta -	Quebec	Canada

ICAR
PROFICIENCY TESTING SCHEME

September 2017

Raw Milk

Determination of CRUDE PROTEIN CONTENT
KJELDAHL Method

Sending date of statistical treatment : 9th October 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
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Table I : **Ranking of the laboratories** Units : g / 100 g

Nb	%	N°	d	Sd	D
1	6	2	+ 0,002	0,005	0,006
2	13	7	+ 0,004	0,008	0,008
3	19	9	- 0,007	0,006	0,009
4	25	10	- 0,008	0,007	0,011
5	31	8	- 0,011	0,008	0,014
6	38	11	+ 0,010	0,013	0,016
7	44	4	- 0,017	0,008	0,019
8	50	14	+ 0,019	0,008	0,021
9	56	1	+ 0,002	0,022	0,022
10	63	12	- 0,017	0,014	0,022
11	69	5	+ 0,012	0,020	0,023
12	75	13	- 0,008	0,022	0,024
13	81	15	+ 0,023	0,012	0,026
14	88	6	+ 0,011	0,026	0,028
15	94	16	- 0,050	0,031	0,059
16	100	3	- 0,054	0,201	0,208

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 8968-1|IDF 20-1), 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}	0,007
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	0,000	0,001	0,008	0,008	0,002	0,003	0,002	0,003	20
2	0,010	0,006	0,001	0,001	0,000	0,001	0,001	0,000	0,008	0,003	0,003	20
3	0,006	0,006	0,006	0,006	0,006	0,000	0,006	0,000	0,006	0,000	0,004	20
4	0,012	0,009	0,011	0,002	0,008	0,009	0,000	0,006	0,015	0,002	0,006	20
5	0,070 *	0,007	0,049 *	0,085 *	0,073 *	0,021	0,002	0,031	0,021	0,004	0,033	20
6	0,002	0,048 *	0,018	0,057 *	0,005	0,093 *	0,004	0,009	0,004	0,053 *	0,030	20
7	0,006	0,007	0,004	0,003	0,013	0,009	0,027	0,001	0,010	0,020	0,009	20
8	0,003	0,002	0,021	0,017	0,008	0,006	0,016	0,007	0,000	0,001	0,008	20
9	0,004	0,006	0,003	0,002	0,008	0,004	0,005	0,006	0,005	0,003	0,004	20
10	0,015	0,006	0,002	0,003	0,009	0,012	0,000	0,003	0,007	0,005	0,005	20
11	0,008	0,006	0,001	0,006	0,006	0,006	0,015	0,001	0,003	0,000	0,005	20
12	0,003	0,013	0,002	0,010	0,004	0,001	0,011	0,008	0,026	0,008	0,008	20
13	0,033 *	0,008	0,017	0,014	0,000	0,013	0,006	0,011	0,002	0,005	0,010	20
14	0,002	0,001	0,005	0,008	0,004	0,002	0,004	0,006	0,008	0,003	0,003	20
15	0,006	0,006	0,024	0,010	0,012	0,011	0,001	0,034	0,003	0,017	0,011	20
16	0,010	0,014	0,065 *	0,005	0,006	0,102 *	0,027	0,003	0,002	0,030 *	0,029	20
Sr	0,014	0,010	0,016	0,019	0,014	0,025	0,008	0,009	0,007	0,012		320
NE	32	32	32	32	32	32	32	32	32	32		
L	0,020	0,020	0,030	0,021	0,019	0,024	0,032	0,034	0,028	0,021		

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 / IDF 20

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

(*) : Data have been modified in right units.

(*) Sample / Lab code	1	2	3	4	5	6	7	8	9	10
1	3,817	3,593	3,316	2,973	2,792	3,717	3,518	3,161	3,294	2,890
2	3,798	3,611	3,322	2,951	2,766	3,720	3,536	3,150	3,347	2,871
3	3,825	3,627	3,327	2,964	2,772	3,720	3,531	3,152	2,715 *	2,877
4	3,774	3,589	3,319	2,926	2,745	3,700	3,508	3,131	3,336	2,853
5	3,800	3,583	3,372	2,979	2,801	3,719	3,531	3,150	3,338	2,897
6	3,806	3,629	3,343	2,924	2,784	3,689	3,530	3,214	3,356	2,890
7	3,800	3,625	3,325	2,954	2,764	3,711	3,526	3,149	3,355	2,881
8	3,795	3,602	3,306	2,943	2,745	3,700	3,505	3,141	3,333	2,867
9	3,792	3,612	3,320	2,946	2,758	3,699	3,514	3,136	3,337	2,870
10	3,778	3,606	3,323	2,949	2,761	3,690	3,514	3,138	3,340	2,872
11	3,803	3,620	3,326	2,955	2,766	3,719	3,542	3,151	3,355	2,918
12	3,783	3,596	3,318	2,935	2,755	3,703	3,515	3,135	3,283	2,857
13	3,758	3,578	3,287	2,947	2,762	3,695	3,543	3,159	3,366	2,882
14	3,823	3,639	3,348	2,966	2,778	3,733	3,548	3,165	3,364	2,882
15	3,798	3,620	3,344	2,982	2,788	3,750	3,556	3,188	3,373	2,885
16	3,747	3,576	3,311	2,879 *	2,700 *	3,723	3,438 *	3,081	3,268	2,828
M	3,793	3,607	3,325	2,953	2,769	3,712	3,528	3,150	3,336	2,876
REF.	3,795	3,607	3,325	2,953	2,769	3,711	3,528	3,150	3,340	2,877
SD	0,022	0,019	0,019	0,018	0,017	0,016	0,015	0,028	0,031	0,020

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 15 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; 13	6	5; 16	5; 6	5	6; 16				6; 16
Outlier Grubbs				16	16		16		3	
sr	0,005	0,005	0,008	0,006	0,005	0,007	0,007	0,009	0,007	0,006
SR	0,021	0,020	0,017	0,016	0,015	0,017	0,016	0,029	0,032	0,017

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	+ 0,023	- 0,013	- 0,008	+ 0,020	+ 0,023	+ 0,006	- 0,010	+ 0,011	- 0,046	+ 0,013	+ 0,002	0,022	0,27
2	+ 0,003	+ 0,004	- 0,003	- 0,002	- 0,003	+ 0,009	+ 0,009	+ 0,000	+ 0,007	- 0,006	+ 0,002	0,005	1,21
3	+ 0,030	+ 0,020	+ 0,002	+ 0,011	+ 0,003	+ 0,009	+ 0,004	+ 0,002	- 0,625	+ 0,001	- 0,054	0,201	0,86
4	- 0,021	- 0,018	- 0,006	- 0,027	- 0,024	- 0,010	- 0,020	- 0,019	- 0,003	- 0,024	- 0,017	0,008	6,87
5	+ 0,005	- 0,024	+ 0,047	+ 0,026	+ 0,032	+ 0,008	+ 0,003	+ 0,001	- 0,001	+ 0,020	+ 0,012	0,020	1,84
6	+ 0,011	+ 0,022	+ 0,018	- 0,029	+ 0,015	- 0,022	+ 0,003	+ 0,065	+ 0,017	+ 0,013	+ 0,011	0,026	1,39
7	+ 0,005	+ 0,019	- 0,000	+ 0,001	- 0,005	- 0,000	- 0,002	- 0,000	+ 0,016	+ 0,004	+ 0,004	0,008	1,55
8	+ 0,001	- 0,005	- 0,018	- 0,009	- 0,024	- 0,011	- 0,023	- 0,008	- 0,007	- 0,010	- 0,011	0,008	4,60
9	- 0,003	+ 0,006	- 0,004	- 0,007	- 0,011	- 0,012	- 0,013	- 0,013	- 0,002	- 0,007	- 0,007	0,006	3,49
10	- 0,017	- 0,001	- 0,002	- 0,004	- 0,008	- 0,021	- 0,013	- 0,012	- 0,000	- 0,005	- 0,008	0,007	3,66
11	+ 0,008	+ 0,014	+ 0,001	+ 0,002	- 0,003	+ 0,009	+ 0,014	+ 0,001	+ 0,015	+ 0,041	+ 0,010	0,013	2,57
12	- 0,011	- 0,010	- 0,007	- 0,018	- 0,014	- 0,008	- 0,012	- 0,014	- 0,056	- 0,020	- 0,017	0,014	3,79
13	- 0,037	- 0,029	- 0,038	- 0,006	- 0,007	- 0,016	+ 0,015	+ 0,010	+ 0,026	+ 0,006	- 0,008	0,022	1,08
14	+ 0,028	+ 0,032	+ 0,023	+ 0,013	+ 0,010	+ 0,023	+ 0,020	+ 0,015	+ 0,024	+ 0,006	+ 0,019	0,008	7,40
15	+ 0,003	+ 0,014	+ 0,019	+ 0,029	+ 0,020	+ 0,039	+ 0,028	+ 0,039	+ 0,033	+ 0,009	+ 0,023	0,012	5,91
16	- 0,048	- 0,030	- 0,014	- 0,074	- 0,069	+ 0,012	- 0,089	- 0,069	- 0,072	- 0,049	- 0,050	0,031	5,06
d	- 0,001	- 0,000	+ 0,001	- 0,000	+ 0,000	+ 0,001	+ 0,000	+ 0,001	- 0,003	- 0,001	- 0,006	0,054	
Sd	0,022	0,019	0,019	0,018	0,017	0,016	0,015	0,028	0,031	0,020	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 8968-1|IDF 20-1 : Precision of the method : Sr = 0.014 g / 100 g
SR = 0.018 g / 100 g

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

Sample/Lab Code	1	2	3	4	5	6	7	8	9	10
1	+1,04	-0,69	-0,44	+1,14	+1,40	+0,35	-0,66	+0,41	-1,46	+0,64
2	+0,15	+0,23	-0,13	-0,09	-0,18	+0,54	+0,58	+0,01	+0,23	-0,28
3	+1,39	+1,05	+0,12	+0,60	+0,20	+0,54	+0,24	+0,08	-20,08	+0,04
4	-0,96	-0,92	-0,33	-1,52	-1,43	-0,63	-1,30	-0,66	-0,10	-1,18
5	+0,22	-1,23	+2,41	+1,47	+1,94	+0,48	+0,22	+0,02	-0,04	+1,00
6	+0,52	+1,15	+0,94	-1,66	+0,89	-1,34	+0,18	+2,31	+0,53	+0,65
7	+0,22	+0,97	-0,02	+0,08	-0,28	-0,01	-0,11	-0,01	+0,50	+0,19
8	+0,03	-0,25	-0,95	-0,54	-1,43	-0,65	-1,48	-0,30	-0,22	-0,50
9	-0,12	+0,29	-0,23	-0,39	-0,64	-0,70	-0,88	-0,47	-0,07	-0,33
10	-0,80	-0,04	-0,10	-0,25	-0,49	-1,27	-0,88	-0,42	-0,00	-0,25
11	+0,39	+0,70	+0,03	+0,11	-0,17	+0,52	+0,91	+0,04	+0,49	+2,02
12	-0,53	-0,54	-0,38	-1,04	-0,85	-0,46	-0,81	-0,51	-1,82	-0,98
13	-1,73	-1,48	-1,98	-0,34	-0,41	-0,98	+0,99	+0,35	+0,84	+0,29
14	+1,29	+1,64	+1,20	+0,75	+0,58	+1,37	+1,33	+0,55	+0,78	+0,27
15	+0,13	+0,70	+1,01	+1,67	+1,17	+2,36	+1,85	+1,39	+1,07	+0,43
16	-2,23	-1,57	-0,72	-4,19	-4,13	+0,74	-5,84	-2,44	-2,32	-2,42

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

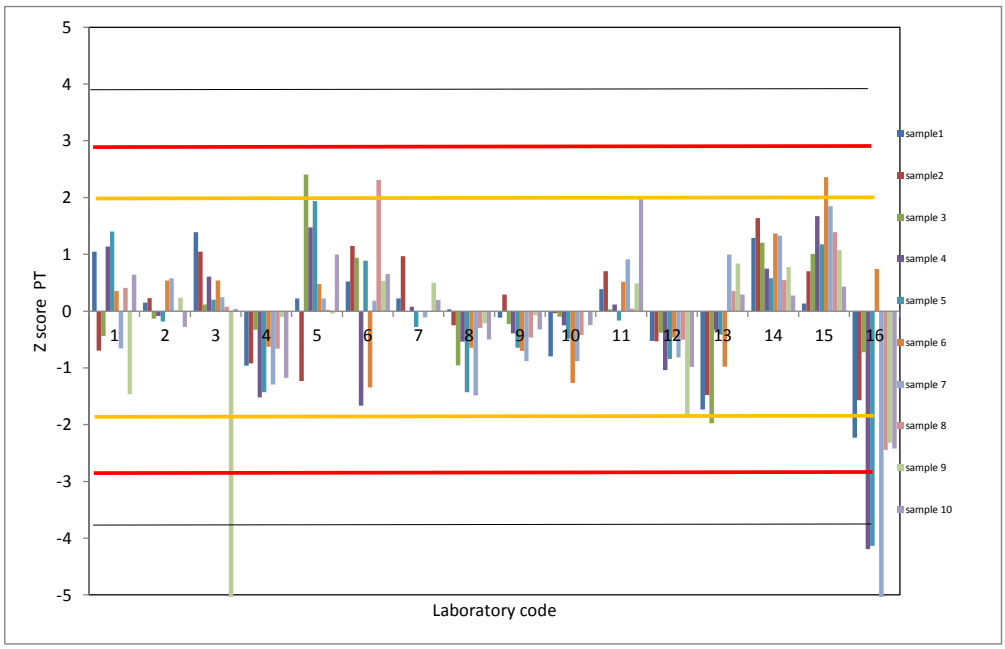


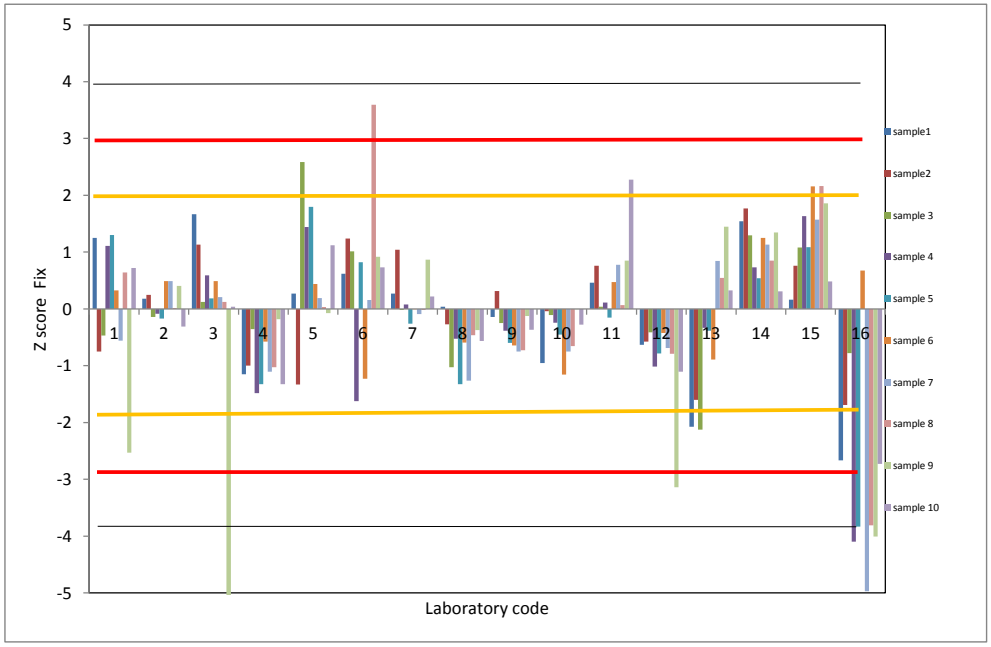
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample Lab Code	1	2	3	4	5	6	7	8	9	10
1	+1,25	-0,75	-0,47	+1,11	+1,30	+0,32	-0,56	+0,64	-2,53	+0,72
2	+0,18	+0,24	-0,14	-0,08	-0,17	+0,49	+0,49	+0,02	+0,40	-0,31
3	+1,67	+1,13	+0,12	+0,59	+0,18	+0,49	+0,21	+0,12	-34,72	+0,04
4	-1,15	-1,00	-0,35	-1,48	-1,32	-0,57	-1,10	-1,03	-0,18	-1,32
5	+0,27	-1,33	+2,59	+1,44	+1,80	+0,44	+0,19	+0,03	-0,07	+1,12
6	+0,62	+1,24	+1,01	-1,63	+0,82	-1,23	+0,15	+3,60	+0,92	+0,73
7	+0,27	+1,04	-0,02	+0,08	-0,26	-0,01	-0,09	-0,02	+0,87	+0,22
8	+0,04	-0,27	-1,03	-0,53	-1,32	-0,59	-1,26	-0,46	-0,38	-0,56
9	-0,14	+0,32	-0,25	-0,39	-0,60	-0,64	-0,75	-0,73	-0,13	-0,37
10	-0,96	-0,04	-0,11	-0,24	-0,45	-1,16	-0,75	-0,66	-0,00	-0,28
11	+0,46	+0,76	+0,04	+0,11	-0,15	+0,47	+0,78	+0,07	+0,85	+2,27
12	-0,63	-0,58	-0,41	-1,01	-0,78	-0,42	-0,69	-0,79	-3,14	-1,11
13	-2,07	-1,60	-2,13	-0,33	-0,38	-0,89	+0,85	+0,55	+1,45	+0,32
14	+1,54	+1,77	+1,29	+0,73	+0,54	+1,25	+1,13	+0,85	+1,34	+0,31
15	+0,16	+0,76	+1,08	+1,64	+1,09	+2,16	+1,57	+2,16	+1,86	+0,48
16	-2,67	-1,69	-0,78	-4,10	-3,83	+0,68	-4,97	-3,81	-4,01	-2,73

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



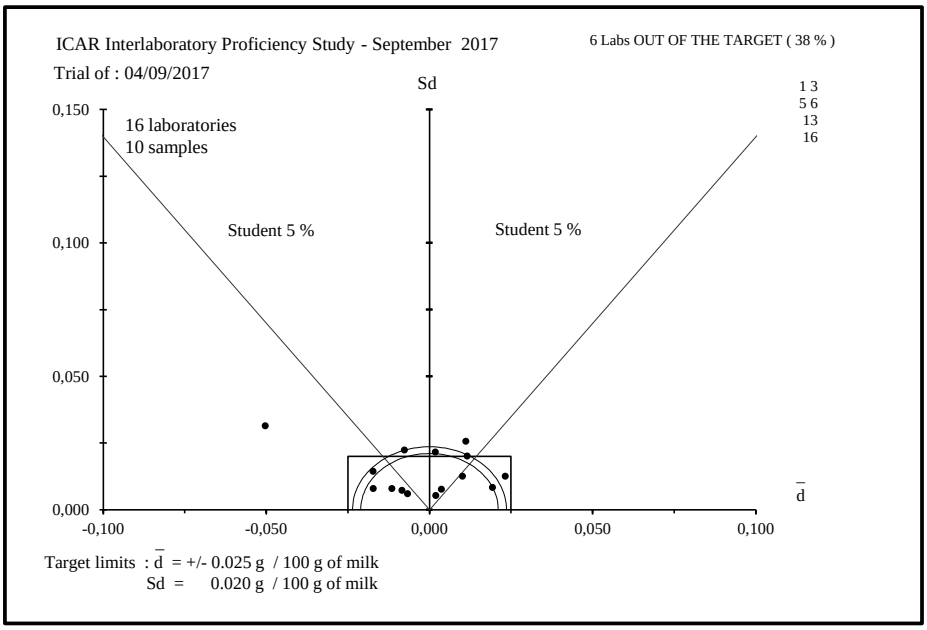


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST
RAW MILK
NITROGEN CONTENT
September 2017

Name	City	Country
Actalia	Poligny	France
Agroscope	Bern-Liebefeld	Switzerland
Central Milk Lab ICBA	Caesarea	IL
Department Valorisation des productions Agricoles	Gembloux	Belgium
Eastern Lab services	Medina	USA
ILVO	Melle	Belgium
Japan Dairy Technical Association	Tokyo	Japan
Lab Agroalimentario de Santander	Santander Cantabria	Spain
Laboratorio Standard Latte	Maccarese	Italy
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Pruszkow	Poland
Milchprüfring Baden-Württemberg e.V.	Kirchheim unter Teck	Germany
Pieno Tyrimai	Kaunas	Lithuania
Qlip B.V.,	Zutphen	NL
Teagasc Food research Center	Cork	IR
The National laboratory for raw milk Agrovyzkum Rapotin s.r.o.	Vikyrovice	Czech Republic
Valacta - Centre d'Expertise en Production Laitière du Québec	Quebec	Canada

ICAR
PROFICIENCY TESTING SCHEME

September 2017

Raw Milk

Determination of LACTOSE CONTENT

Sending date of statistical treatment : 9th October 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

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

Nb	%	N°	d	Sd	D	**Method**
1	7	13	- 0,010	0,020	0,023	IDF 214
2	13	5	+ 0,011	0,021	0,024	N.C.
3	20	9	+ 0,026	0,018	0,032	IDF 214
4	27	1	- 0,038	0,018	0,042	Own method
5	33	3	- 0,016	0,043	0,046	Enzymatic method
6	40	7	- 0,049	0,018	0,052	IDF 198
7	47	14	- 0,025	0,048	0,054	IDF 79B:1991
8	53	2	+ 0,056	0,023	0,061	Polarimeter
9	60	6	- 0,059	0,019	0,062	IDF 198
10	67	12	- 0,066	0,028	0,072	IDF 198
11	73	8	- 0,025	0,080	0,084	IDF 214
12	80	4	+ 0,059	0,098	0,115	IDF 214
13	87	10	+ 0,091	0,079	0,121	Lane-Eynon
14	93	15	+ 0,021	0,205	0,206	Polarimeter
15	100	11	+ 0,315	0,078	0,324	analyse à flux continu

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

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

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

REF : Assigned values are robust average values per sample according to algorithm A of standard ISO 13528, of 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}	0,014
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	0,091

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

Sample / Lab code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0,006	0,014	0,006	0,004	0,005	0,004	0,001	0,008	0,001	0,002	0,004	20
2	0,000	0,000	0,010	0,000	0,010	0,010	0,010	0,010	0,010	0,000	0,005	20
3	0,018	0,019	0,018	0,037	0,000	0,019	0,038	0,037	0,019	0,001	0,017	20
4	0,077 *	0,056 *	0,003	0,016	0,021	0,012	0,023	0,025	0,038	0,013	0,025	20
5	0,020	0,010	0,000	0,000	0,010	0,010	0,010	0,000	0,010	0,000	0,007	20
6	0,001	0,005	0,001	0,023	0,026	0,034	0,014	0,007	0,013	0,005	0,012	20
7	0,003	0,014	0,004	0,010	0,008	0,000	0,006	0,006	0,001	0,006	0,005	20
8	0,033	0,080 *	0,035	0,009	0,063 *	0,018	0,005	0,068	0,006	0,015	0,030	20
9	0,000	0,000	0,005	0,008	0,004	0,003	0,001	0,021	0,027	0,012	0,008	20
10	0,003	0,012	0,010	0,012	0,004	0,027	0,006	0,001	0,020	0,013	0,009	20
11	0,019	0,165 *	0,010	0,000	0,039	0,039	0,117 *	0,010	0,117 *	0,087 *	0,057	20
12	0,005	0,008	0,002	0,007	0,000	0,011	0,039	0,036	0,033	0,001	0,014	20
13	0,004	0,008	0,004	0,021	0,006	0,063	0,004	0,064	0,010	0,002	0,021	20
14	0,003	0,028	0,030	0,018	0,008	0,020	0,031	0,024	0,020	0,013	0,015	20
15	0,015	0,015	0,029	0,059 *	0,029	0,044	0,015	0,017	0,060	0,017	0,024	20
Sr	0,017	0,036	0,011	0,015	0,016	0,019	0,025	0,021	0,027	0,017		300
NE	30	30	30	30	30	30	30	30	30	30		
L	0,035	0,034	0,042	0,041	0,044	0,072	0,051	0,080	0,065	0,024		

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**

(*) : Data have been modified in the right units.

	Sample / Lab code	1	2	3	4	5	6	7	8	9	10
	1	5,109	5,043	4,960	4,861	4,742	4,676	4,610	4,553	4,486	4,643
	2	5,230	5,170	5,075	4,970	4,835	4,765	4,695	4,625	4,555	4,700
	3	5,163	4,995	5,010	4,904	4,757	4,749	4,608	4,519	4,530	4,670
	4	5,072	4,914	5,075	4,982	4,882	4,830	4,764	4,714	4,635	4,783
	5	5,180	5,115	5,010	4,910	4,795	4,725	4,655	4,590	4,515	4,670
	6	5,082	5,026	5,005	4,834	4,719	4,628	4,583	4,521	4,468	4,609
	7	5,102	5,031	4,945	4,852	4,730	4,668	4,599	4,545	4,474	4,623
(*)	8	5,192	5,147	5,125	4,939	4,696	4,627	4,577	4,481	4,430	4,590
	9	5,159	5,116	5,024	4,941	4,811	4,729	4,672	4,618	4,538	4,713
	10	5,141	5,097	5,007	5,012	4,979	4,836	4,798	4,770	4,672	4,659
	11	5,534 *	5,451	5,248	5,252 *	5,117	5,117 *	5,010 *	4,879	4,718	4,879 *
	12	5,116	5,008	4,917	4,826	4,705	4,641	4,596	4,530	4,464	4,594
	13	5,117	5,063	5,000	4,886	4,759	4,731	4,631	4,591	4,512	4,667
	14	5,048	5,011	4,960	4,868	4,739	4,715	4,666	4,647	4,505	4,655
	15	5,327 *	5,403 *	5,265	4,982	4,940	4,566	4,572	4,259	4,375	4,576
	M	5,131	5,106	5,042	4,912	4,814	4,706	4,645	4,589	4,525	4,654
	REF.	5,130	5,081	5,028	4,912	4,802	4,707	4,637	4,591	4,520	4,650
	SD	0,052	0,146	0,102	0,060	0,119	0,077	0,069	0,140	0,091	0,055

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	4	4; 8; 11		15	8		11	8	11	11
Outlier Grubbs	11; 15			11		11	11			11
sr	0,009	0,009	0,011	0,011	0,012	0,018	0,014	0,021	0,017	0,007
SR	0,051	0,112	0,103	0,060	0,119	0,078	0,070	0,141	0,077	0,056

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	- 0,021	- 0,038	- 0,068	- 0,051	- 0,060	- 0,031	- 0,028	- 0,038	- 0,035	- 0,007	- 0,038	0,018	6,54
2	+ 0,100	+ 0,089	+ 0,047	+ 0,058	+ 0,033	+ 0,058	+ 0,058	+ 0,034	+ 0,035	+ 0,050	+ 0,056	0,023	7,85
3	+ 0,033	- 0,086	- 0,018	- 0,008	- 0,045	+ 0,042	- 0,029	- 0,073	+ 0,009	+ 0,020	- 0,016	0,043	1,14
4	- 0,059	- 0,167	+ 0,047	+ 0,070	+ 0,080	+ 0,123	+ 0,126	+ 0,122	+ 0,115	+ 0,133	+ 0,059	0,098	1,90
5	+ 0,050	+ 0,034	- 0,018	- 0,002	- 0,007	+ 0,018	+ 0,018	- 0,001	- 0,005	+ 0,020	+ 0,011	0,021	1,62
6	- 0,049	- 0,055	- 0,023	- 0,078	- 0,083	- 0,079	- 0,054	- 0,071	- 0,053	- 0,041	- 0,059	0,019	9,77
7	- 0,029	- 0,050	- 0,083	- 0,060	- 0,072	- 0,039	- 0,038	- 0,046	- 0,047	- 0,027	- 0,049	0,018	8,59
8	+ 0,062	+ 0,066	+ 0,097	+ 0,028	- 0,106	- 0,080	- 0,060	- 0,111	- 0,090	- 0,060	- 0,025	0,080	1,01
9	+ 0,029	+ 0,035	- 0,004	+ 0,029	+ 0,009	+ 0,022	+ 0,034	+ 0,026	+ 0,017	+ 0,063	+ 0,026	0,018	4,62
10	+ 0,010	+ 0,016	- 0,021	+ 0,100	+ 0,177	+ 0,129	+ 0,161	+ 0,178	+ 0,152	+ 0,009	+ 0,091	0,079	3,64
11	+ 0,404	+ 0,371	+ 0,220	+ 0,341	+ 0,315	+ 0,410	+ 0,372	+ 0,287	+ 0,198	+ 0,229	+ 0,315	0,078	12,75
12	- 0,015	- 0,073	- 0,111	- 0,086	- 0,097	- 0,066	- 0,042	- 0,061	- 0,057	- 0,056	- 0,066	0,028	7,61
13	- 0,013	- 0,018	- 0,028	- 0,026	- 0,043	+ 0,024	- 0,006	- 0,000	- 0,008	+ 0,017	- 0,010	0,020	1,58
14	- 0,083	- 0,070	- 0,068	- 0,044	- 0,063	+ 0,008	+ 0,028	+ 0,056	- 0,015	+ 0,005	- 0,025	0,048	1,63
15	+ 0,197	+ 0,323	+ 0,237	+ 0,071	+ 0,138	- 0,141	- 0,065	- 0,332	- 0,145	- 0,074	+ 0,021	0,205	0,32
d	+ 0,001	+ 0,025	+ 0,014	+ 0,000	+ 0,012	- 0,001	+ 0,007	- 0,002	+ 0,005	+ 0,004	+ 0,019	0,114	
Sd	0,052	0,146	0,102	0,060	0,119	0,077	0,069	0,140	0,091	0,055	0,097		

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	-0,41	-0,26	-0,66	-0,84	-0,51	-0,40	-0,40	-0,27	-0,38	-0,12
2	+1,91	+0,61	+0,46	+0,96	+0,28	+0,75	+0,83	+0,24	+0,38	+0,91
3	+0,63	-0,59	-0,17	-0,14	-0,38	+0,54	-0,42	-0,52	+0,10	+0,36
4	-1,13	-1,14	+0,46	+1,16	+0,67	+1,60	+1,82	+0,87	+1,26	+2,40
5	+0,95	+0,24	-0,17	-0,03	-0,06	+0,24	+0,26	-0,01	-0,06	+0,37
6	-0,94	-0,38	-0,23	-1,30	-0,69	-1,02	-0,78	-0,51	-0,58	-0,75
7	-0,55	-0,34	-0,81	-0,99	-0,60	-0,50	-0,55	-0,33	-0,51	-0,48
8	+1,19	+0,45	+0,95	+0,46	-0,89	-1,03	-0,87	-0,79	-0,99	-1,08
9	+0,55	+0,24	-0,04	+0,48	+0,08	+0,28	+0,49	+0,19	+0,19	+1,14
10	+0,20	+0,11	-0,20	+1,66	+1,49	+1,67	+2,32	+1,27	+1,67	+0,16
11	+7,75	+2,54	+2,15	+5,64	+2,64	+5,31	+5,38	+2,05	+2,18	+4,14
12	-0,28	-0,50	-1,08	-1,43	-0,81	-0,86	-0,60	-0,44	-0,62	-1,02
13	-0,25	-0,12	-0,27	-0,44	-0,36	+0,31	-0,09	-0,00	-0,09	+0,31
14	-1,59	-0,48	-0,66	-0,73	-0,53	+0,11	+0,41	+0,40	-0,17	+0,09
15	+3,78	+2,21	+2,32	+1,17	+1,16	-1,82	-0,94	-2,37	-1,60	-1,33

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

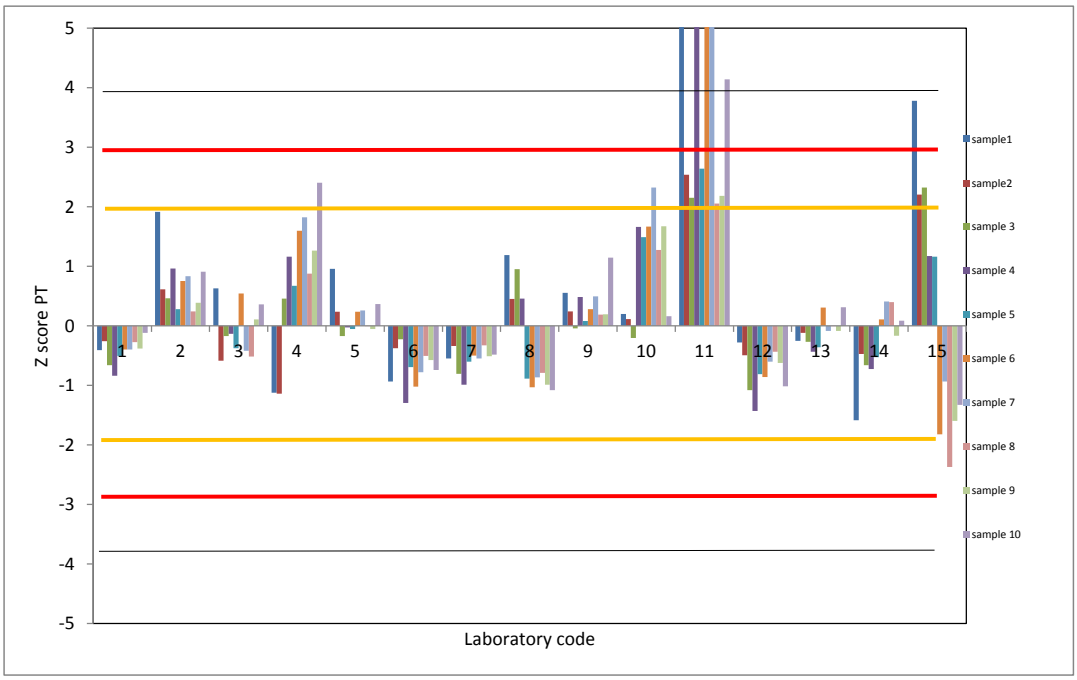


Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

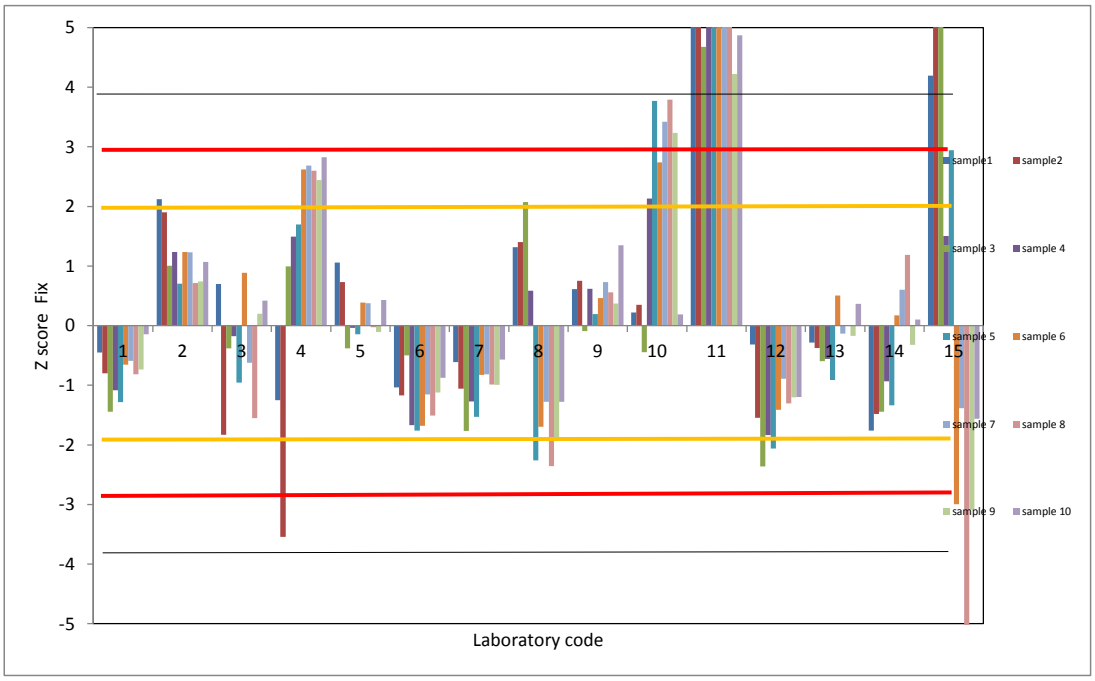
Sample/Lab code	1	2	3	4	5	6	7	8	9	10
1	-0,45	-0,80	-1,44	-1,08	-1,28	-0,66	-0,59	-0,82	-0,74	-0,14
2	+2,12	+1,90	+1,00	+1,24	+0,71	+1,24	+1,23	+0,72	+0,74	+1,07
3	+0,70	-1,83	-0,38	-0,18	-0,95	+0,89	-0,62	-1,55	+0,20	+0,42
4	-1,25	-3,54	+0,99	+1,49	+1,69	+2,62	+2,69	+2,60	+2,44	+2,82
5	+1,06	+0,73	-0,38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

This table will allows to compare your ZSCORE from one PT to an other because the standard deviation has always the value of SR of the method SR=0,047

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

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

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



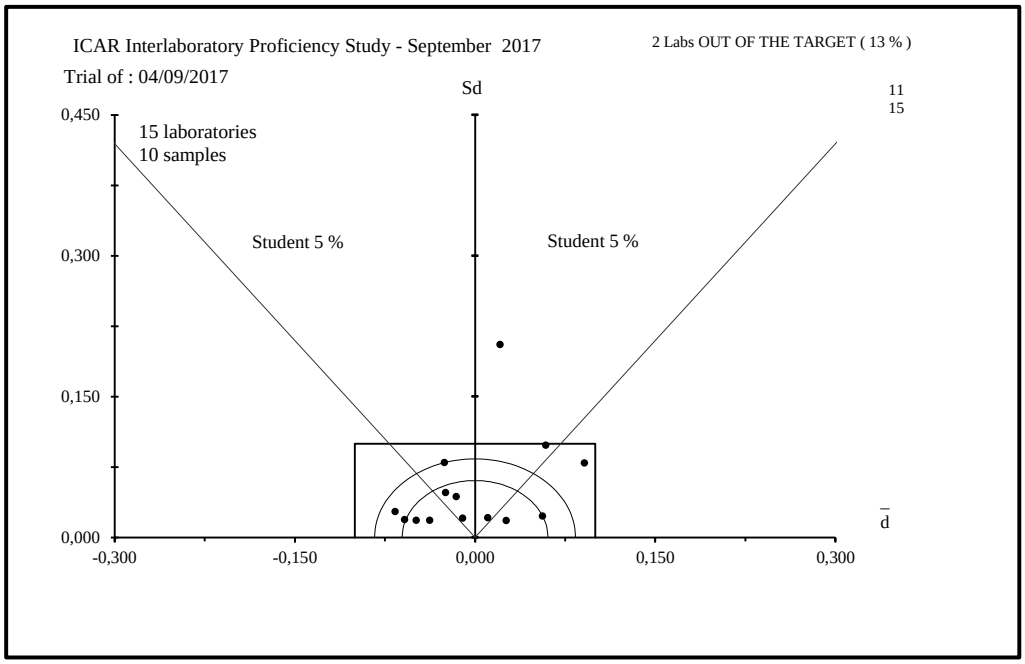


Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**

LIST OF THE PARTICIPANTS ICAR
ICAR PROFICIENCY TEST
RAW MILK
LACTOSE CONTENT
September 2017

Name	City	Country
Agroscope	Bern-Liebefeld	Switzerland
Central Milk Lab ICBA	Caesarea	IL
Department Valorisation des productions Agricoles	Gembloux	Belgium
ILVO	Melle	Belgium
Japan Dairy Technical Association	Tokyo	Japan
Lab Agroalimentario de Santander	Santander Cantabria	Spain
Laboratorio Standard Latte	Maccarese	Italy
Laboratorium Oceny Mleka KCHZ Laboratorium Referecyjne z/s w Parzniewie	Pruszkow	Poland
Milchprüfring Baden-Württemberg e.V.	Kirchheim unter Teck	Germany
Milkom a.s Dairy research institute	Praha	Czech Republic
Pieno Tyrimai	Kaunas	Lithuania
Qlip B.V.,	Zutphen	NL
Teagasc Food research Center	Cork	IR
The National laboratory for raw milk Agrovyzkum Rapotin s.r.o.	Vikyrovice	Czech Republic
Valacta - Centre d'Expertise en Production Laitière du Québec	Quebec	Canada

ICAR
PROFICIENCY TESTING SCHEME

September 2017

Raw Milk

Determination of UREA CONTENT

Sending date of statistical treatment : 9th October 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	10	6	+ 0,20	0,36	0,41	IDF 195
2	20	2	+ 0,49	0,50	0,70	Photometric method
3	30	10	- 0,43	0,64	0,77	IDF 195
4	40	7	+ 0,68	0,37	0,78	IDF 195
5	50	8	+ 0,75	0,54	0,92	Continuous flow analyzer
6	60	3	+ 1,23	0,39	1,29	IDF 195
7	70	4	+ 0,49	1,29	1,38	IDF 195
8	80	5	+ 1,47	0,79	1,67	Continuous flow analyzer
9	90	1	- 1,72	0,32	1,75	IDF 195
10	100	9	- 0,93	11,19	11,23	IDF 195

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

+/- 2,50 mg / 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}	0,57
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	1,19

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

Sample / Lab Code	1	2	3	4	5	6	7	8	9	10	Sr	NL
1	0,50	0,10	0,10	0,20	0,10	0,10	0,50	0,70	0,60	0,40	0,28	20
2	2,30	1,70 *	1,80	0,70	1,40	1,70 *	1,70	2,90	1,20	1,50	1,26	20
3	0,66	0,43	0,03	0,16	0,69	0,07	0,73	1,32	0,52	0,33	0,44	20
4	1,90	0,30	1,30	0,30	0,20	0,40	0,60	0,00	0,30	0,70	0,58	20
5	0,00	0,10	0,10	0,00	0,10	0,00	0,20	0,60	0,00	0,20	0,15	20
6	0,29	0,00	0,29	0,68	0,29	0,49	0,29	0,00	0,10	0,39	0,25	20
7	1,12	0,82	1,07	1,22	1,38	0,68	0,95	1,34	1,18	1,11	0,78	20
8	0,06	0,06	0,41	0,09	0,03	0,28	0,15	0,66	0,31	0,27	0,21	20
9	1,10	0,30	0,10	0,60	0,80	0,20	0,30	0,50	1,00	0,70	0,46	20
10	0,20	0,90	0,30	0,10	0,40	0,50	0,50	0,80	0,30	0,50	0,36	20
Sr	0,78	0,49	0,57	0,39	0,51	0,45	0,52	0,84	0,49	0,51		200
NE	20	20	20	20	20	20	20	20	20	20		
L	2,71	1,09	1,97	1,34	1,78	0,89	1,81	2,92	1,69	1,78		

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**

(*) : Datahave been modified in the right units.

	Sample/Lab Code	1	2	3	4	5	6	7	8	9	10
	1	43,85	24,85	29,55	48,50	34,35	53,15	20,25	57,85	16,20	39,10 *
	2	46,35	27,55	31,70	51,05	37,00	55,25	22,25	59,15	17,60	41,85
	3	47,03	27,78	32,30	52,13	36,79	56,21	22,58	61,35	18,35	42,65
	4	44,65	25,65	30,55	53,75	37,70	56,10	22,20	60,60	16,85	41,65
	5	47,60	27,55	32,35	52,30	37,55	57,70	22,70	61,80	17,90	42,10
(*)	6	45,87	26,80	31,60	50,53	36,65	54,81	22,09	60,19	17,43	40,87
	7	46,30	27,60	32,14	50,66	36,91	55,41	22,58	60,45	18,07	41,53
	8	46,96	27,03	31,81	51,46	36,94	56,05	22,05	60,92	17,34	41,77
	9	45,05	25,55	30,25	49,20	35,50	53,50	21,15	58,35	40,20 *	16,75 *
	10	44,90	26,25	31,15	48,65	35,50	53,95	21,75	59,50	18,05	40,85
	M	45,86	26,66	31,34	50,82	36,49	55,21	21,96	60,02	17,53	41,66
	REF.	45,38	26,35	31,08	50,49	36,20	54,73	21,84	59,76	17,49	41,51
	SD	1,21	1,03	0,94	1,69	1,05	1,40	0,75	1,28	0,68	0,60

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				2				
Outlier Grubbs									9	1; 9
sr	0,78	0,32	0,57	0,39	0,51	0,26	0,52	0,84	0,46	0,54
SR	1,33	1,07	1,03	1,71	1,11	1,50	0,84	1,41	0,75	0,71

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

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	-1,27	-1,46	-1,62	-1,18	-1,77	-1,13	-2,12	-1,49	-1,91	-4,03
2	+0,80	+1,16	+0,66	+0,33	+0,76	+0,37	+0,54	-0,47	+0,16	+0,57
3	+1,37	+1,38	+1,29	+0,97	+0,56	+1,05	+0,97	+1,24	+1,27	+1,90
4	-0,60	-0,68	-0,56	+1,93	+1,43	+0,98	+0,47	+0,66	-0,95	+0,24
5	+1,84	+1,16	+1,35	+1,07	+1,29	+2,12	+1,14	+1,59	+0,60	+0,99
6	+0,41	+0,43	+0,56	+0,03	+0,43	+0,05	+0,32	+0,34	-0,09	-1,06
7	+0,76	+1,21	+1,12	+0,10	+0,68	+0,48	+0,97	+0,54	+0,86	+0,03
8	+1,31	+0,66	+0,78	+0,57	+0,71	+0,94	+0,27	+0,90	-0,23	+0,43
9	-0,27	-0,78	-0,87	-0,76	-0,67	-0,88	-0,92	-1,10	+33,59	-41,40
10	-0,40	-0,10	+0,08	-1,09	-0,67	-0,56	-0,13	-0,20	+0,83	-1,10

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

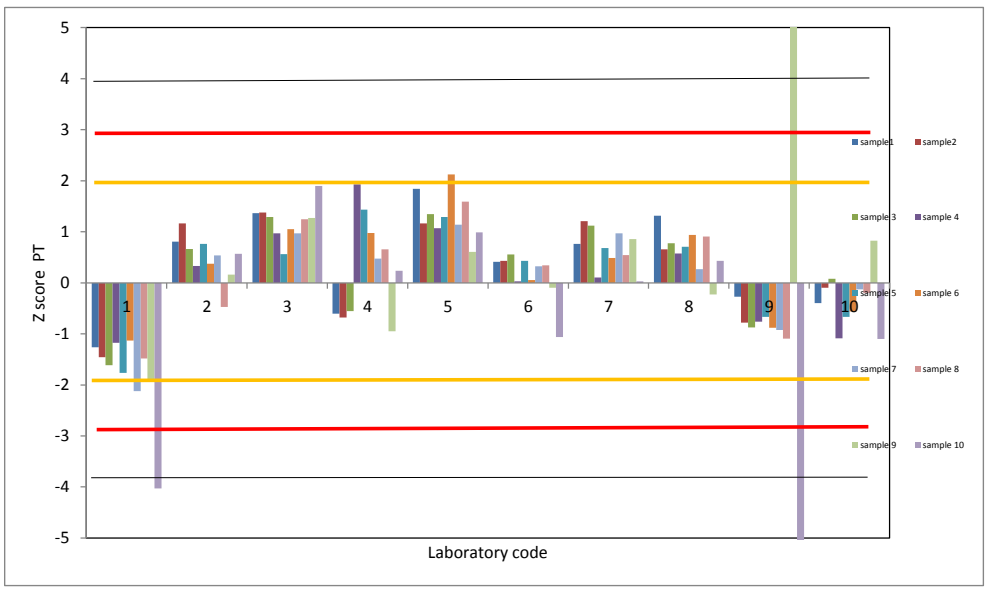


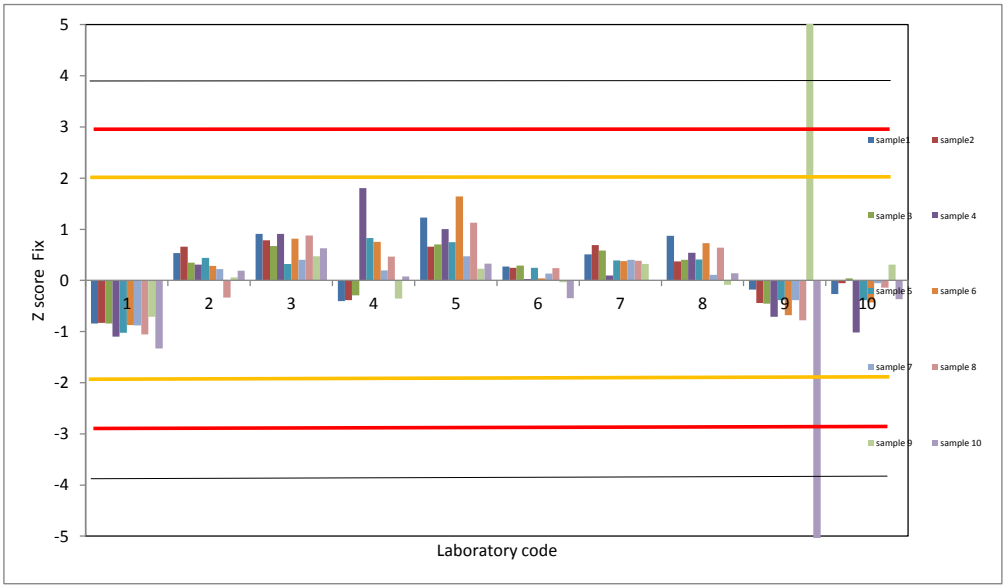
Table VII : **Zscore of the different laboratories for each sample.**
ZS calculated on the standard deviation of reproducibility of the method

Sample/Lab code	1	2	3	4	5	6	7	8	9	10
1	-0,84	-0,83	-0,84	-1,10	-1,02	-0,87	-0,88	-1,05	-0,71	-1,33
2	+0,54	+0,66	+0,34	+0,31	+0,44	+0,29	+0,22	-0,33	+0,06	+0,19
3	+0,91	+0,79	+0,67	+0,91	+0,32	+0,81	+0,40	+0,88	+0,47	+0,63
4	-0,40	-0,39	-0,29	+1,80	+0,83	+0,76	+0,20	+0,47	-0,35	+0,08
5	+1,23	+0,66	+0,70	+1,00	+0,75	+1,64	+0,47	+1,13	+0,23	+0,33
6	+0,27	+0,24	+0,29	+0,02	+0,25	+0,04	+0,13	+0,24	-0,04	-0,35
7	+0,51	+0,69	+0,59	+0,09	+0,39	+0,37	+0,40	+0,38	+0,32	+0,01
8	+0,88	+0,37	+0,40	+0,54	+0,41	+0,73	+0,11	+0,64	-0,09	+0,14
9	-0,18	-0,44	-0,46	-0,71	-0,39	-0,68	-0,38	-0,78	+12,55	-13,68
10	-0,26	-0,06	+0,04	-1,02	-0,39	-0,43	-0,05	-0,14	+0,31	-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=1,81

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

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



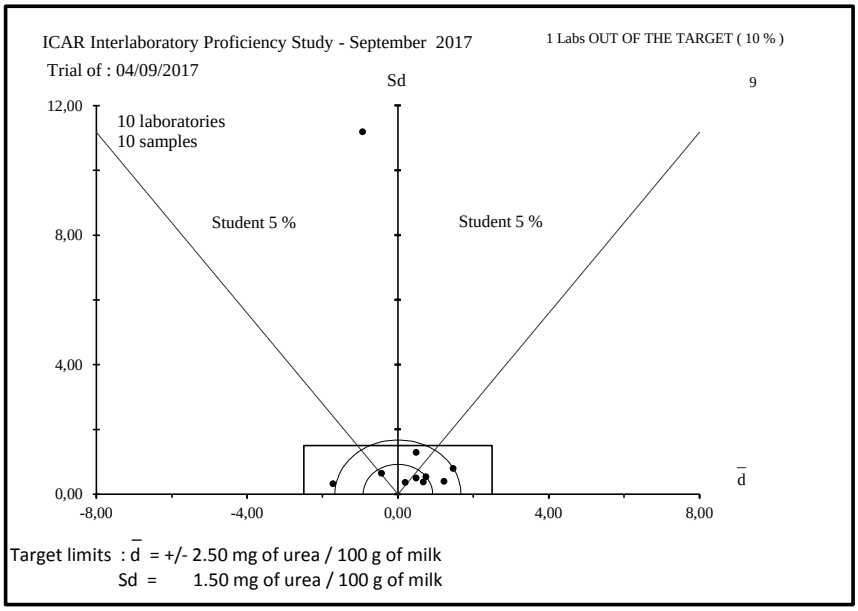


Figure 1 : ACCURACY - Evaluation of the individual performances (to see table I).

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST
RAW MILK
UREA CONTENT
September 2017

Name	City	Country
Actalia	Poligny	France
Agroscope	Bern-Liebefeld	Switzerland
Central Milk Lab ICBA	Caesarea	IL
Department Valorisation des productions Agricoles	Gembloux	Belgium
Laboratorio Standard Latte	Maccarese	Italy
Laboratorium Oceny Mleka KCHZ Parzniewie	Pruszkow	Poland
Milchprüfring Baden-Württemberg e.V.	Kirchheim unter Teck	Germany
Pieno Tyrimai	Kaunas	Lithuania
Qlip B.V.,	Zutphen	NL
Valacta - Centre d'Expertise en Production Laitière du Québec	Quebec	Canada

ICAR
PROFICIENCY TESTING SCHEME

September 2017

Raw Milk

Enumeration of SOMATIC CELLS

Sending date of statistical treatment : 9th October 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	5	+ 1%	3%	4%	B
2	5	35	- 4%	2%	4%	B
3	8	8	- 7%	5%	9%	B
4	10	32	- 9%	5%	11%	B
5	13	34	+ 10%	6%	11%	B
6	15	15	+ 8%	9%	12%	A
7	18	39	- 13%	2%	13%	A
8	20	3	+ 11%	8%	13%	B
9	23	27	- 11%	8%	14%	B
10	25	36	- 14%	3%	14%	B
11	28	40	+ 15%	3%	15%	A
12	30	37	+ 15%	3%	16%	B
13	33	31	- 15%	5%	16%	B
14	35	30	- 16%	3%	16%	B
15	38	1	- 13%	10%	17%	A
16	40	38	- 17%	3%	17%	(1)
17	43	10	+ 14%	10%	17%	A
18	45	4	- 14%	11%	18%	B
19	48	29	- 17%	2%	18%	B
20	50	12	+ 13%	11%	18%	B
21	53	13	- 15%	12%	19%	B
22	55	25	- 15%	13%	20%	B
23	58	18	- 15%	13%	20%	B
24	60	14	- 16%	13%	21%	B
25	63	26	+ 17%	15%	23%	B
26	65	20	+ 20%	15%	25%	B
27	68	23	+ 19%	16%	25%	B
28	70	21	- 19%	16%	25%	B
29	73	16	- 20%	16%	26%	B
30	75	6	- 22%	14%	26%	A
31	78	9	+ 21%	19%	28%	B
32	80	22	+ 20%	20%	29%	B
33	83	2	- 23%	18%	29%	B
34	85	7	- 23%	18%	30%	B
35	88	33	- 29%	8%	30%	B
36	90	28	+ 36%	8%	36%	B
37	93	24	+ 33%	25%	41%	B
38	95	19	+ 38%	29%	48%	B
39	98	11	+ 47%	39%	61%	A
40	100	17	+ 59%	42%	73%	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 39 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
(1) Image Cytometer - NucleoCounter SCC-400

(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}	15	3%
Reproducibility standard deviation of this ICAR proficiency test (after Cochran and Grubbs elimination at 5 %)	SR_{PT}	146	27%

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	0	5	5	10	20	10	10	0	10	20	8	20
2	4	14	8	4	3	5	30	3	4	20	9	20
3	1	2	20	6	9	71	34	18	2	26	20	20
4	2	19	20	2	11	42	0	1	3	4	12	20
5	9	3	11	8	12	43	5	28	7	54	17	20
6	3	46	15	29	53 *	46	25	62	3	3	25	20
7	0	29	11	15	28	18	1	22	2	26	13	20
8	6	15	24	1	2	6	9	4	2	37	11	20
9	8	3	32	26	3	25	18	33	8	98	26	20
10	1	15	3	12	5	28	16	3	8	37	12	20
11	3	7	10	5	5	**	10	25	5	**	8	16
12	4	11	23	2	3	16	2	8	3	8	7	20
13	1	7	4	3	6	5	13	34	16	29	11	20
14	1	0	1	0	0	6	2	0	1	2	2	20
15	1	3	3	3	2	17	10	20	2	62	15	20
16	10	10	0	10	10	10	20	40	0	30	13	20
17	2	2	7	8	2	9	21	59	5	28	16	20
18	1	0	4	5	7	23	20	7	0	28	10	20
19	7	27	20	17	7	12	41	41	4	6	16	20
20	0	5	6	5	8	38	4	24	1	1	10	20
21	0	10	10	2	10	32	11	60	8	2	16	20
22	5	4	3	3	5	44	7	71	3	3	19	20
23	2	24	16	39	18	56	4	54	6	26	22	20
24	1	23	2	23	19	91	22	111 *	13	48	35	20
25	2	34	7	10	20	2	21	19	8	16	12	20
26	17 *	9	39	13	7	9	27	7	12	86	23	20
27	1	38	5	10	3	15	12	15	4	20	11	20
28	3	11	5	20	7	31	15	35	11	18	13	20
29	2	7	4	1	1	7	4	8	2	6	3	20
30	5	6	1	3	8	20	44	2	4	15	12	20
31	3	5	2	3	4	10	5	17	5	7	5	20
32	4	2	17	22	11	30	0	27	10	21	12	20
33	13	21	3	1	17	1	8	32	2	9	10	20
34	0	55	8	23	45 *	8	36	26	7	66	25	20
35	8	34	4	29	24	3	63	23	0	38	21	20
36	2	26	7	11	6	35	40	17	29 *	10	16	20
37	0	17	21	13	6	46	16	3	0	26	14	20
38	3	9	2	10	12	20	40	9	3	8	11	20
39	1	3	3	5	9	3	5	2	4	7	3	20
40	1	9	2	4	6	20	15	35	2	21	11	20
Sr	4	14	9	10	11	22	16	24	5	24		796
r	25	63	42	42	50	126	63	126	25	126		
NE	80	80	80	80	80	78	80	80	80	78		
L	13	60	41	43	34	94	69	91	19	103		

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 were to modify 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	40	448	233	145	340	925	605	790	75	1070
	2	34	402	208	129	293	819	507	698	60	959
	3	48	578	304	191	433	1178	817	1017	110	1255
	4	34	455	214	143	328	911	600	800	71	1054
	5	42	551	264	173	390	1093	690	888	90	1260
	6	42	404	160	100	304	835	560	740	54	999
	7	30	417	193	133	305	855	524	678	65	927
	8	39	478	231	157	346	997	630	854	81	1149
	9	51	634	297	192	469	1292	793	1141	102	1513
	10	52	600	302	186	449	1209	791	1030	104	1385
	11	60	893	432	266	662		1141	1503	119	
	12	44	601	292	197	426	1204	783	1026	94	1411
	13	34	438	224	152	335	904	578	758	78	1077
	14	41	454	221	146	314	905	580	746	70	1022
	15	40	569	264	175	400	1176	723	981	83	1359
	16	25	425	210	135	315	845	540	700	70	1005
	17	67	878	423	285	658	1633	1104	1452	139	1884
	18	36	434	216	155	335	904	572	781	78	1026
	19	83	* 752	376	239	494	1342	952	1290	134	1746
	20	47	665	313	200	466	1239	845	1107	104	1448
	21	36	426	218	135	309	843	565	732	79	975
	22	55	581	299	194	462	1313	783	1139	98	1526
	23	55	619	312	208	460	1248	819	1077	107	1498
	24	55	735	350	230	510	1428	882	1232	113	1586
	25	38	444	226	151	325	895	595	762	72	1040
(*)	26	50	605	308	194	450	1274	820	1033	95	1467
	27	39	459	218	142	334	928	606	810	77	1145
	28	67	706	352	222	523	1438	900	1249	130	1685
	29	36	448	219	136	309	892	536	757	74	1023
	30	35	453	221	143	321	890	567	766	79	1025
	31	30	443	219	143	332	894	578	779	73	1053
	32	43	470	240	144	340	977	623	825	70	1127
	33	41	362	177	115	278	754	480	679	63	863
	34	49	589	257	172	415	1192	705	1052	95	1369
	35	42	499	250	170	368	1039	655	867	81	1183
	36	34	447	221	139	321	901	617	796	71	1055
	37	48	610	309	202	441	1236	766	1019	104	1441
	38	39	437	220	148	320	874	572	734	77	1034
	39	40	447	234	148	335	924	608	791	76	1072
	40	51	576	306	185	443	1260	785	1048	101	1397
	M	43	536	263	170	391	1063	695	928	88	1234
	REF.	43	526	260	168	385	1060	686	918	87	1227
	SD	10	128	63	40	92	214	158	214	21	254

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 39 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	26				6; 34			24	36	
Outlier Grubbs	19									
sr	3	14	9	10	8	22	16	21	4	24
SR	10	128	63	41	94	215	158	212	21	254
sr %	7%	3%	4%	6%	2%	2%	2%	2%	5%	2%
SR %	23%	24%	24%	24%	24%	20%	23%	23%	24%	21%

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	- 6%	- 15%	- 10%	- 14%	- 12%	- 13%	- 12%	- 14%	- 14%	- 13%	- 13%	10%	3,92
2	- 20%	- 24%	- 20%	- 23%	- 24%	- 23%	- 26%	- 24%	- 31%	- 22%	- 23%	18%	4,12
3	+ 11%	+ 10%	+ 17%	+ 14%	+ 12%	+ 11%	+ 19%	+ 11%	+ 27%	+ 2%	+ 11%	8%	4,15
4	- 20%	- 14%	- 18%	- 15%	- 15%	- 14%	- 13%	- 13%	- 19%	- 14%	- 14%	11%	4,22
5	- 3%	+ 5%	+ 1%	+ 3%	+ 1%	+ 3%	+ 1%	- 3%	+ 3%	+ 3%	+ 1%	3%	1,34
6	- 3%	- 23%	- 39%	- 41%	- 21%	- 21%	- 18%	- 19%	- 38%	- 19%	- 22%	14%	4,84
7	- 30%	- 21%	- 26%	- 21%	- 21%	- 19%	- 24%	- 26%	- 25%	- 24%	- 23%	18%	3,94
8	- 9%	- 9%	- 11%	- 7%	- 10%	- 6%	- 8%	- 7%	- 7%	- 6%	- 7%	5%	4,76
9	+ 20%	+ 20%	+ 14%	+ 14%	+ 22%	+ 22%	+ 16%	+ 24%	+ 18%	+ 23%	+ 21%	19%	3,53
10	+ 21%	+ 14%	+ 16%	+ 11%	+ 16%	+ 14%	+ 15%	+ 12%	+ 20%	+ 13%	+ 14%	10%	4,32
11	+ 39%	+ 70%	+ 66%	+ 58%	+ 72%		+ 66%	+ 64%	+ 37%		+ 47%	39%	3,42
12	+ 3%	+ 14%	+ 12%	+ 17%	+ 10%	+ 14%	+ 14%	+ 12%	+ 8%	+ 15%	+ 13%	11%	3,72
13	- 21%	- 17%	- 14%	- 10%	- 13%	- 15%	- 16%	- 17%	- 10%	- 12%	- 15%	12%	3,98
14	- 5%	- 14%	- 15%	- 13%	- 18%	- 15%	- 15%	- 19%	- 20%	- 17%	- 16%	13%	3,85
15	- 7%	+ 8%	+ 1%	+ 4%	+ 4%	+ 11%	+ 5%	+ 7%	- 4%	+ 11%	+ 8%	9%	2,63
16	- 41%	- 19%	- 19%	- 20%	- 18%	- 20%	- 21%	- 24%	- 19%	- 18%	- 20%	16%	4,06
17	+ 57%	+ 67%	+ 63%	+ 70%	+ 71%	+ 54%	+ 61%	+ 58%	+ 60%	+ 54%	+ 59%	42%	4,42
18	- 17%	- 18%	- 17%	- 8%	- 13%	- 15%	- 17%	- 15%	- 10%	- 16%	- 15%	13%	3,82
19	+ 93%	+ 43%	+ 45%	+ 42%	+ 28%	+ 27%	+ 39%	+ 40%	+ 54%	+ 42%	+ 38%	29%	4,10
20	+ 10%	+ 26%	+ 21%	+ 19%	+ 21%	+ 17%	+ 23%	+ 21%	+ 19%	+ 18%	+ 20%	15%	4,28
21	- 16%	- 19%	- 16%	- 20%	- 20%	- 20%	- 18%	- 20%	- 9%	- 21%	- 19%	16%	3,73
22	+ 28%	+ 10%	+ 15%	+ 15%	+ 20%	+ 24%	+ 14%	+ 24%	+ 12%	+ 24%	+ 20%	20%	3,19
23	+ 29%	+ 18%	+ 20%	+ 24%	+ 19%	+ 18%	+ 19%	+ 17%	+ 23%	+ 22%	+ 19%	16%	3,97
24	+ 28%	+ 40%	+ 35%	+ 37%	+ 32%	+ 35%	+ 29%	+ 34%	+ 30%	+ 29%	+ 33%	25%	4,13
25	- 11%	- 16%	- 13%	- 10%	- 16%	- 16%	- 13%	- 17%	- 17%	- 15%	- 15%	13%	3,81
26	+ 16%	+ 15%	+ 18%	+ 15%	+ 17%	+ 20%	+ 19%	+ 12%	+ 9%	+ 20%	+ 17%	15%	3,59
27	- 10%	- 13%	- 16%	- 15%	- 13%	- 12%	- 12%	- 12%	- 11%	- 7%	- 11%	8%	4,57
28	+ 56%	+ 34%	+ 35%	+ 32%	+ 36%	+ 36%	+ 31%	+ 36%	+ 49%	+ 37%	+ 36%	8%	14,22
29	- 16%	- 15%	- 16%	- 19%	- 20%	- 16%	- 22%	- 18%	- 15%	- 17%	- 17%	2%	22,94
30	- 19%	- 14%	- 15%	- 15%	- 17%	- 16%	- 17%	- 17%	- 9%	- 16%	- 16%	3%	18,77
31	- 31%	- 16%	- 16%	- 15%	- 14%	- 16%	- 16%	- 15%	- 16%	- 14%	- 15%	5%	9,70
32	+ 1%	- 11%	- 8%	- 14%	- 12%	- 8%	- 9%	- 10%	- 19%	- 8%	- 9%	5%	5,75
33	- 5%	- 31%	- 32%	- 32%	- 28%	- 29%	- 30%	- 26%	- 27%	- 30%	- 29%	8%	11,50
34	+ 15%	+ 12%	- 1%	+ 2%	+ 8%	+ 12%	+ 3%	+ 15%	+ 9%	+ 12%	+ 10%	6%	5,66
35	- 2%	- 5%	- 4%	+ 1%	- 4%	- 2%	- 5%	- 6%	- 7%	- 4%	- 4%	2%	5,50
36	- 20%	- 15%	- 15%	- 18%	- 17%	- 15%	- 10%	- 13%	- 19%	- 14%	- 14%	3%	15,38
37	+ 13%	+ 16%	+ 19%	+ 20%	+ 15%	+ 17%	+ 12%	+ 11%	+ 20%	+ 17%	+ 15%	3%	14,47
38	- 10%	- 17%	- 15%	- 12%	- 17%	- 18%	- 17%	- 20%	- 12%	- 16%	- 17%	3%	16,91
39	- 7%	- 15%	- 10%	- 12%	- 13%	- 13%	- 11%	- 14%	- 12%	- 13%	- 13%	2%	19,03
40	+ 18%	+ 9%	+ 18%	+ 10%	+ 15%	+ 19%	+ 14%	+ 14%	+ 16%	+ 14%	+ 15%	3%	14,39
d	+ 1%	+ 2%	+ 1%	+ 1%	+ 2%	+ 0%	+ 1%	+ 1%	+ 1%	+ 1%	- 1%	23%	
Sd	23%	24%	24%	24%	24%	20%	23%	23%	24%	21%			

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	-0,28	-0,62	-0,43	-0,57	-0,49	-0,63	-0,51	-0,60	-0,57	-0,62
2	-0,90	-0,97	-0,82	-0,97	-1,00	-1,13	-1,14	-1,03	-1,30	-1,06
3	+0,50	+0,40	+0,70	+0,57	+0,51	+0,55	+0,83	+0,46	+1,13	+0,11
4	-0,90	-0,56	-0,73	-0,62	-0,62	-0,69	-0,55	-0,55	-0,79	-0,68
5	-0,12	+0,19	+0,06	+0,12	+0,05	+0,15	+0,02	-0,14	+0,13	+0,13
6	-0,12	-0,96	-1,59	-1,71	-0,88	-1,05	-0,80	-0,83	-1,61	-0,90
7	-1,32	-0,86	-1,07	-0,89	-0,87	-0,96	-1,03	-1,12	-1,06	-1,18
8	-0,38	-0,38	-0,46	-0,29	-0,42	-0,29	-0,36	-0,30	-0,28	-0,31
9	+0,87	+0,84	+0,59	+0,60	+0,90	+1,08	+0,68	+1,04	+0,74	+1,13
10	+0,92	+0,57	+0,66	+0,45	+0,69	+0,70	+0,67	+0,52	+0,84	+0,62
11	+1,75	+2,86	+2,74	+2,43	+2,99		+2,89	+2,73	+1,54	
12	+0,14	+0,58	+0,51	+0,72	+0,44	+0,67	+0,62	+0,50	+0,33	+0,73
13	-0,95	-0,69	-0,57	-0,41	-0,54	-0,73	-0,69	-0,75	-0,43	-0,59
14	-0,23	-0,57	-0,62	-0,55	-0,77	-0,72	-0,67	-0,80	-0,84	-0,81
15	-0,33	+0,33	+0,06	+0,16	+0,16	+0,54	+0,24	+0,29	-0,18	+0,52
16	-1,84	-0,79	-0,79	-0,82	-0,76	-1,00	-0,93	-1,02	-0,81	-0,87
17	+2,53	+2,75	+2,59	+2,92	+2,95	+2,67	+2,65	+2,49	+2,51	+2,59
18	-0,75	-0,72	-0,69	-0,34	-0,55	-0,73	-0,72	-0,64	-0,43	-0,79
19	+4,14	+1,76	+1,85	+1,76	+1,17	+1,32	+1,69	+1,73	+2,29	+2,05
20	+0,45	+1,08	+0,85	+0,79	+0,87	+0,84	+1,01	+0,88	+0,81	+0,87
21	-0,69	-0,78	-0,66	-0,82	-0,82	-1,01	-0,77	-0,87	-0,38	-0,99
22	+1,23	+0,43	+0,62	+0,64	+0,83	+1,18	+0,61	+1,03	+0,52	+1,18
23	+1,28	+0,72	+0,83	+0,99	+0,81	+0,88	+0,85	+0,74	+0,98	+1,07
24	+1,23	+1,63	+1,43	+1,54	+1,35	+1,72	+1,24	+1,46	+1,25	+1,42
25	-0,49	-0,64	-0,54	-0,42	-0,65	-0,77	-0,58	-0,73	-0,72	-0,74
26	+0,71	+0,61	+0,76	+0,64	+0,70	+1,00	+0,85	+0,53	+0,40	+0,95
27	-0,43	-0,53	-0,67	-0,65	-0,56	-0,62	-0,51	-0,51	-0,47	-0,32
28	+2,48	+1,40	+1,46	+1,35	+1,49	+1,76	+1,36	+1,54	+2,07	+1,81
29	-0,69	-0,62	-0,65	-0,81	-0,83	-0,79	-0,95	-0,75	-0,62	-0,80
30	-0,85	-0,57	-0,62	-0,64	-0,69	-0,79	-0,75	-0,71	-0,38	-0,80
31	-1,37	-0,66	-0,65	-0,64	-0,57	-0,77	-0,69	-0,65	-0,69	-0,69
32	+0,03	-0,44	-0,32	-0,60	-0,49	-0,39	-0,40	-0,44	-0,81	-0,39
33	-0,23	-1,29	-1,32	-1,34	-1,16	-1,43	-1,31	-1,12	-1,15	-1,44
34	+0,66	+0,49	-0,04	+0,09	+0,32	+0,62	+0,12	+0,62	+0,38	+0,56
35	-0,07	-0,21	-0,15	+0,04	-0,19	-0,10	-0,20	-0,24	-0,28	-0,17
36	-0,90	-0,62	-0,62	-0,74	-0,69	-0,74	-0,44	-0,57	-0,79	-0,68
37	+0,55	+0,65	+0,78	+0,84	+0,60	+0,82	+0,51	+0,47	+0,84	+0,85
38	-0,43	-0,70	-0,63	-0,50	-0,70	-0,87	-0,72	-0,86	-0,50	-0,76
39	-0,33	-0,62	-0,42	-0,51	-0,55	-0,64	-0,50	-0,59	-0,52	-0,61
40	+0,82	+0,38	+0,74	+0,42	+0,63	+0,93	+0,63	+0,60	+0,69	+0,67

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

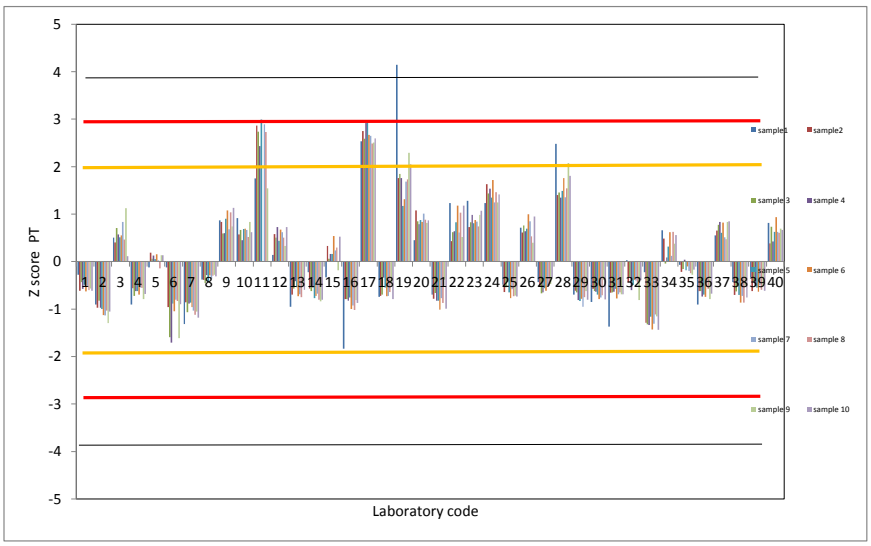


Table VII : **Zscore of the different laboratories for each sample.**

ZS calculated on the standard deviation of reproducibility of the method

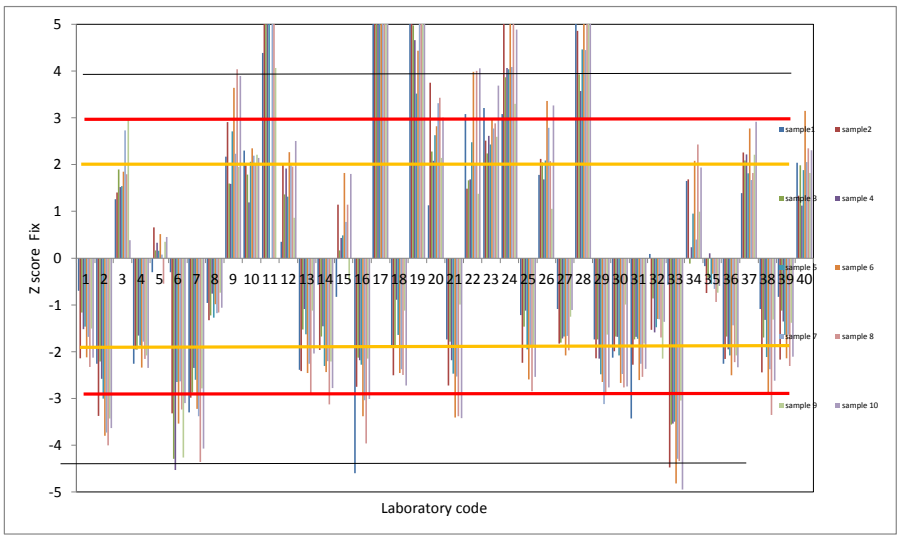
Sample/Lab code	1	2	3	4	5	6	7	8	9	10
1	-0,69	-2,14	-1,16	-1,52	-1,46	-2,12	-1,68	-2,33	-1,51	-2,13
2	-2,26	-3,38	-2,21	-2,58	-3,01	-3,80	-3,73	-4,01	-3,43	-3,64
3	+1,26	+1,40	+1,90	+1,52	+1,54	+1,85	+2,73	+1,79	+2,98	+0,39
4	-2,26	-1,95	-1,95	-1,65	-1,87	-2,34	-1,79	-2,15	-2,08	-2,35
5	-0,30	+0,65	+0,16	+0,33	+0,16	+0,51	+0,08	-0,55	+0,35	+0,45
6	-0,30	-3,32	-4,29	-4,53	-2,65	-3,54	-2,63	-3,23	-4,26	-3,10
7	-3,30	-2,98	-2,87	-2,35	-2,60	-3,22	-3,38	-4,36	-2,79	-4,07
8	-0,95	-1,33	-1,23	-0,76	-1,27	-0,99	-1,17	-1,16	-0,74	-1,06
9	+2,17	+2,91	+1,60	+1,59	+2,71	+3,64	+2,23	+4,04	+1,95	+3,89
10	+2,30	+1,98	+1,79	+1,19	+2,06	+2,35	+2,19	+2,02	+2,21	+2,15
11	+4,38	+9,94	+7,37	+6,45	+8,97		+9,48	+10,61	+4,06	
12	+0,35	+2,01	+1,36	+1,92	+1,31	+2,27	+2,02	+1,96	+0,86	+2,51
13	-2,39	-2,41	-1,53	-1,09	-1,63	-2,46	-2,26	-2,91	-1,12	-2,04
14	-0,56	-1,96	-1,68	-1,45	-2,31	-2,43	-2,21	-3,12	-2,21	-2,78
15	-0,82	+1,14	+0,16	+0,43	+0,48	+1,82	+0,77	+1,14	-0,48	+1,80
16	-4,60	-2,75	-2,13	-2,18	-2,28	-3,38	-3,04	-3,96	-2,15	-3,01
17	+6,34	+9,54	+6,97	+7,74	+8,86	+9,01	+8,70	+9,68	+6,63	+8,93
18	-1,87	-2,51	-1,87	-0,89	-1,64	-2,46	-2,37	-2,50	-1,12	-2,73
19	+10,37	+6,11	+4,98	+4,66	+3,52	+4,44	+5,53	+6,74	+6,05	+7,06
20	+1,13	+3,75	+2,28	+2,08	+2,63	+2,82	+3,31	+3,43	+2,14	+3,00
21	-1,74	-2,72	-1,78	-2,18	-2,47	-3,41	-2,53	-3,38	-0,99	-3,42
22	+3,08	+1,48	+1,66	+1,69	+2,48	+3,98	+2,01	+4,00	+1,37	+4,06
23	+3,21	+2,51	+2,24	+2,61	+2,43	+2,96	+2,77	+2,88	+2,59	+3,69
24	+3,08	+5,65	+3,86	+4,07	+4,04	+5,78	+4,09	+5,69	+3,30	+4,88
25	-1,22	-2,24	-1,46	-1,12	-1,95	-2,59	-1,90	-2,84	-1,89	-2,54
26	+1,78	+2,12	+2,05	+1,69	+2,09	+3,36	+2,78	+2,08	+1,05	+3,27
27	-1,09	-1,83	-1,80	-1,72	-1,68	-2,08	-1,66	-1,97	-1,25	-1,11
28	+6,21	+4,86	+3,93	+3,57	+4,46	+5,94	+4,45	+6,00	+5,47	+6,23
29	-1,74	-2,14	-1,74	-2,15	-2,49	-2,65	-3,12	-2,93	-1,63	-2,77
30	-2,13	-1,99	-1,68	-1,69	-2,08	-2,67	-2,48	-2,76	-0,99	-2,75
31	-3,43	-2,28	-1,74	-1,69	-1,72	-2,61	-2,26	-2,53	-1,83	-2,37
32	+0,09	-1,53	-0,86	-1,59	-1,48	-1,30	-1,31	-1,70	-2,15	-1,36
33	-0,56	-4,47	-3,56	-3,54	-3,49	-4,82	-4,29	-4,34	-3,04	-4,95
34	+1,65	+1,69	-0,11	+0,23	+0,95	+2,08	+0,40	+2,43	+0,99	+1,93
35	-0,17	-0,74	-0,41	+0,10	-0,56	-0,34	-0,65	-0,94	-0,74	-0,59
36	-2,26	-2,15	-1,68	-1,95	-2,08	-2,51	-1,43	-2,23	-2,08	-2,33
37	+1,39	+2,26	+2,09	+2,22	+1,81	+2,77	+1,67	+1,82	+2,21	+2,91
38	-1,09	-2,44	-1,70	-1,32	-2,11	-2,92	-2,37	-3,35	-1,31	-2,62
39	-0,82	-2,17	-1,12	-1,36	-1,64	-2,14	-1,63	-2,31	-1,38	-2,11
40	+2,04	+1,33	+1,98	+1,12	+1,88	+3,15	+2,05	+2,35	+1,82	+2,31

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



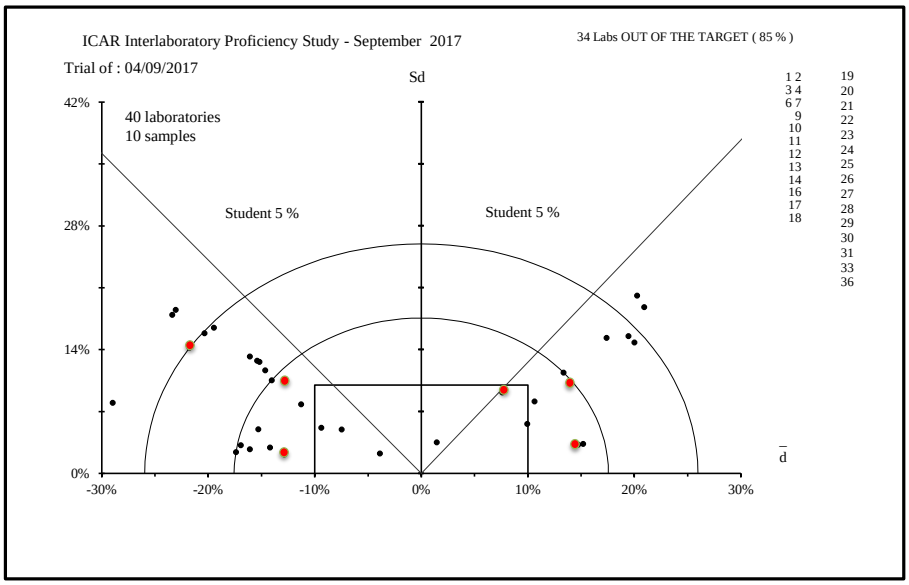


Figure 1 : **ACCURACY - Evaluation of the individual performances (to see table I).**
Reference Method ISO 13366-1 IDF 148-1

LIST OF THE PARTICIPANTS ICAR

ICAR PROFICIENCY TEST

RAW MILK

Somatic Cell Counting

Sep 17

Name	City	Country
Actalia	Poligny	France
Agroscope	3003 Bern-Liebefeld	Switzerland
Alip	Sousada	Portugal
Cattle Information Service (CIS)	Teiford Shropshire TF3BD	England
Central Milk Lab ICBA	Caesarea	IL
ChemoMetec A/S	Allerød	Denmark
Comité du Lait ASBL	Battice	Belgium
Dairy Cattle Res. Center Shandong Academy of Agr. Sc.	Shandong	China
Deltamune	Centurion - Pretoria	South Africa
Direction de l' Amelioration Genetique	Sidi Thabet	Tunisie
Eastern Lab services	Medina	USA
Eurofins Steins Laboratory A/B	Jönköping	Sweden
Eurofins Steins Laboratory A/S	Vejen	Denmark
Holstein-Ro Breeders Association Laboratory	Bucharest	Romania
Lab Agroalimentario de Santander	Santander Cantabria	Spain
Laborator pro rozbor mléka Brno,	Brno	Czech Republic
Laborator pro rozbor mléka Bustehrad,	Bustehrad	Czech Republic
Laboratorija mleka, Poljoprivredni fakultet Novi Sad,	Novi Sad	Serbia
Laboratorio Standard Latte	Maccarese	Italy
Laboratorium Oceny Mleka KCHZ Parzniewie	Pruszkow	Poland
Merieux NutriScience J Bay	Cape Town	South Africa
Merieux Nutriscience South Africa	Cape Town	South Africa
Merieux Nutriscience South Africa (Midrand)	Midrand	South Africa
Milchprüfring Baden-Württemberg e.V.	Kirchheim unter Teck	Germany
Osuuskunta Satamaito, laboratorio	Pori	Finland
Pieno Tyrimai	Kaunas	Lithuania
Qlip B.V.,	Zutphen	NL
Shangai dairy breeding center Co.Ltd	Shanghai	China
Suisselab AG	Zullikofen	Switzerland
Taiwan Livestock Research Institute	Taiwan	Taiwan
Univ. of Pretoria Dept Production Animal Studies Milk Lab	Pretoria	South Africa
Valacta - Centre d'Expertise en Production Laitière du Québec	Quebec	Canada
Valio Oy/Seinajoen aluelaboratorio	Seinajoki	Finland