Continuous improvement for dairy laboratories through REDELAC

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Abstract

Since 1991, REDELAC, the argentine dairy laboratory network, has been an important tool for quality assurance of the laboratories. It provides them different proficiency testing schemes, reference materials from SICECAL, the argentine centralized calibration system, and specific technical assistance. All focused on the optimization of the accuracy of laboratories results, and the improvement of their analytical performances. Since 2009, technical assistance has been mainly oriented to continuous improvement, detecting potential deviations and finding improvement opportunities of laboratories participating in the Network. Specific indicators were defined and several quality tools were selected, and a survey of all participants was carried out. Then, we made a segmentation using selected indicators, and finally we defined five groups, depending on the technical assistance required. Consequently, an Alarm System has been implemented from the laboratories results of proficiency testing schemes related to raw milk quality. Based on the results, INTI-Lácteos provides recommendations to correct occurred deviations, as well as to prevent potential ones. With the implementation of this Alarm System, we have obtained good results, indicating the effectiveness and consolidation of REDELAC-SICECAL, as an integrated system for quality assurance laboratories.

Keywords: Milk, dairy national reference laboratory, continuous improvement, technical assistance, integrated system, centralized calibration system, proficiency tests.

1.0 Introduction

REDELAC, *the Argentine Dairy Laboratory Network*, was created in 1991 by INTI-Lácteos, which is one of the 32 centres of INTI, National Institute of Industrial Technology. The objective of the network is to harmonize dairy laboratory practices, help implementation of international standards, and ensure traceability to national and international laboratories. Nowadays, REDELAC, with more than 40 partners and 100 national and international participating laboratories, has become a "complete integrated system", which offers different proficiency testing schemes, centralized calibrations and a monitoring and alarm system based on the results of this PT schemes.

INTI-Lácteos is the Reference National Laboratory of Argentina and has been the first accredited proficiency testing provider in Latin America in 2004. Different proficiency testing schemes are supplied on a variety of matrices and for different compositional, microbiological and chemical parameters. SICECAL is a Centralized Calibration System, widely recognized in Argentina and provides reference materials in dairy matrices for calibration and control of their equipment to dairy industry and laboratories. Since 2009, technical assistance has been mainly oriented to continuous improvement, detecting potential deviations and finding improvement opportunities of laboratories participating in the Network.

2.0 Methodology

Technical assistance has been mainly focused on continuous improvement of participant laboratories in PTs schemes related to raw milk quality: *Monthly Raw Milk Control* and *Instrumental Equipment Control*. Both proficiency testing are mandatory requirements for independent laboratories which are members of the government system for milk payment. Laboratories receive blind samples to analyze fat, total protein, total solids, lactose, ash, presence of antibiotics, freezing point, enumeration of microorganisms at 30 ºC and somatic cells counts. In the first stage, a survey of all participants and the different routine methodology used by them was carried out.

Then, specific indicators were defined and several quality tools were selected. The unsatisfactory results of a proficiency testing round were considered as a deviation from a requirement, and these were evaluated as nonconforming work (NC).

The indicators and quality tools were:

Index	1: ratio NC / total tests 2: ratio NC / total participant laboratories. 3: ratio NC / each parameters
Tools	Final reports of each round, where the historical performance for each parameter is included (Annex 1) Monthly table of NC of all laboratories (Annex 2) Annual table of NC of each laboratory (Annex 3) Monthly graphic of NC of all the parameters (Annex 4) Annual graphic of NC of each parameter (Annex 5, example fat content) Annual graphic of Index 1 for each laboratory (Annex 6)
Ishikawa diagrams	Check lists of each parameter (Annex 9)

Using the first index mentioned, in order to plan work throughout the year, segmentation was made from the laboratories performances, to determine and evaluate the several degrees of technical assistance required. Five groups were defined; one of them was the SIGALEC group, the laboratories of the government system for milk payment.

Group	Indicator 1 Value
Group 1	0,00 – 0,10
Group 2	0,1 – 0,20
Group 3	0,21 – 0,25
Group 4	> 0,25
SIGALEC	0,08 – 0,12
Group	Indicator 1 Value

Finally, in accordance with the segmentation, annual aims were proposed.

From the results of each round, we monitored laboratories' continuing performance, using the selected indicators and quality tools, mentioned above. The value of those indicators and the trends showed in graphics, alert us when a punctual technical assistance is detected. In this situation, participant to these PT programmes were contacted to provide help and try to correct or avoid deviations in future rounds. Consequently, corrective or preventive recommendations were provided by telephone or e-mail. All possible root causes were considered, bearing in mind the Ishikawa diagrams. In order to prevent non conformities works, detected trends were taken into account from graphics. Records of all communications were preserved.

3.0 Results and discussion

With the implementation of this Alarm System in rounds of *Monthly Raw Milk Control* and *Instrumental Equipment Control*, at the end of 2009 was achieved:

1. Less number of laboratories with indicator Nº1 greater than 0, 21.
2. Improving significantly the performance of some laboratories from Group Nº4. 2 laboratories moved to Group 3, and 1 laboratory moved to Group 2. (Annex 6).
3. Remarkable tendency to decrease the ratio of NC to the total tests, throughout the year. (Annex 7).
4. Decrease the number of NC in three parameters with the highest percentage of NC. Fat content decrease from 35% in January to 18% in December; total protein content decrease from 39% in January to 12% in December, and total solids content decrease from 50 % in January to 7% in December.

5. Identification for the near future (Annex 8), tests and laboratories which will require special emphasis to help.

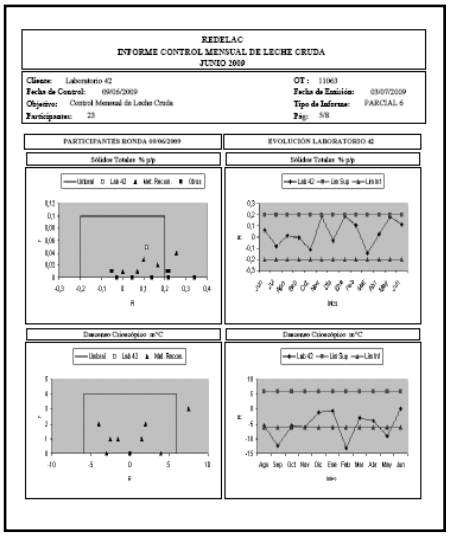
We recommended implementing corrective or preventing actions first, and then monitoring the results associated to ensure that those actions have been effectives. Furthermore, be willing to cooperate with participants to improve their performance, designing check lists for each test and offered it laboratories when lacks of knowledge about official methodology are detected. Answers and feedback may be carefully evaluated and, when it is necessary, subsequent communications must be do it until feasible solution. This Alarm System allowed us distinguishes in following rounds if actions taken have been effectives.

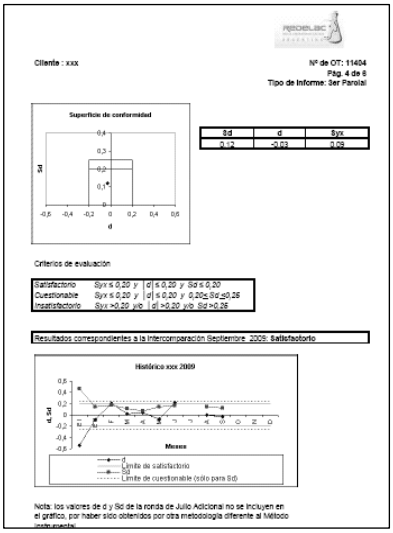
4.0 Conclusions

With the implementation of this Alarm System INTI–Lácteos has established a new tool for continuous improvement for dairy laboratories, indicating the effectiveness and consolidation of REDELAC-SICECAL, as an integrated system to improve the quality assurance of dairy laboratories.

5.0 Annexes

Annex 1


REDELAC
INFORME CONTROL MENSUAL DE LECHE CRUDA
JUNIO 2009


Cliente : xxx
Nº de OT: 11404
Tipo de Informe: 5er Parcial
Superficie de conformidad
Criterios de evaluación
Resultados correspondientes a la Intercomparación Septiembre 2008: Satisfactorio
Histórico xxx 2009
Nota: los valores de d y Sd de la ronda de Julio Adicional no se incluyen en el gráfico, por haber sido obtenidos por otra metodología diferente al Método instrumental

Annex 2

Monthly table of NC of all laboratories
(July 2009)

ITEM	Registration N°	Laboratory name	tests N°	FC	TP	TS	L	A	FP	ESC	EM 30°C	DI	NC
		A	0										0
		B	8	1	1	1		1	1	1	1 1	1	1
		C	9	1 1	1	1	1	1	1 1	1 1	1	1	3
		D	1								1 1		1
		E	7	1	1 1	1		1	1		1 1	1	2
		F	7	1	1	1		1		1	1	1	0
		G	1								1		0
		H	0										0
		I	8	1	1	1	1		1	1	1	1	0

		FC	TP	TS	L	A	FP	ESC	EM 30°C	DI	NC
Total tests	123	17	18	15	9	6	11	17	16	14	Total
		2	4	0	0	0	1	1	4	0	12
%NC		11,8	22,2	0,0	0,0	0,0	9,1	5,9	25,0	0,0	9,8

Indice 1 = NC / N° de ensayos totales: 0,10
Indice 2 = NC/ N° total de laboratorios : 0,57

FC:Fat Content – **TP**: Total Protein - **TS**:Total solid – **L**:lactose – **A**:ash – **FP**: Freezing Point – **ESC**:Enumeration of somatic cells – **EM** 30ºC: Enumeration de microorganisms 30ºC – **DI**: Detection of inhibitors.

Annex 3

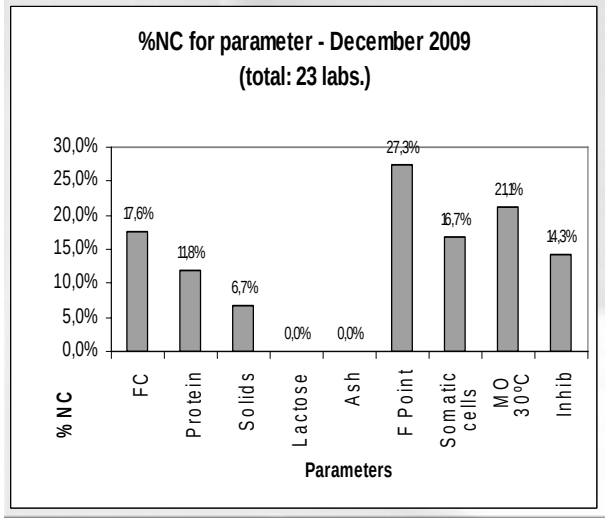
Annual table of NonConformities - Laboratory X

Month	test N°	FC	TP	TS	L	A	FP	ESC	EM 30°C	DI	NC / month
January	7	1 1	1	1		1		1	1	1	1
Feb	7	1	1	1		1		1	1	1	0
March	0										0
Apr	7	1	1	1		1		1	1	1	0
May	7	1 1	1 1	1		1		1	1	1	2
June	7	1	1	1		1		1	1	1	0
July	7	1	1	1		1		1	1	1	0
Ag	7	1	1	1		1		1	1	1	0
Sept	7	1	1	1		1		1	1	1	0
	56	8	8	8	0	8	0	8	8	8	
		2	1	0	0	0	0	0	0	0	3
	%	25,0	12,5								5,4

Index 1 = NC/N° total tests: 0,05

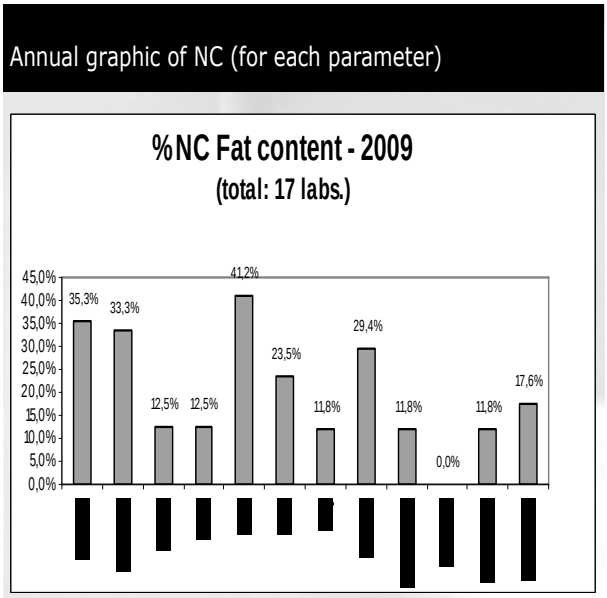
Annex 4

Monthly graphic of NC (for all parameters)

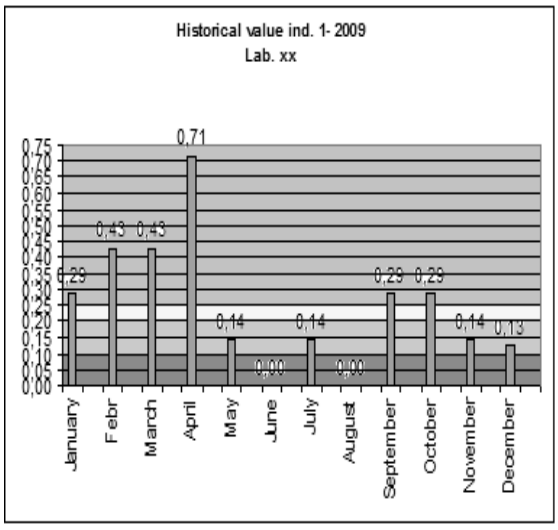


Annex 5

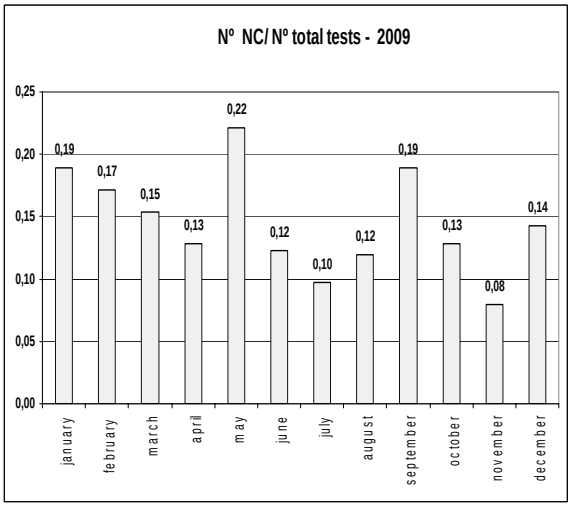
Annual graphic of NC (for each parameter)



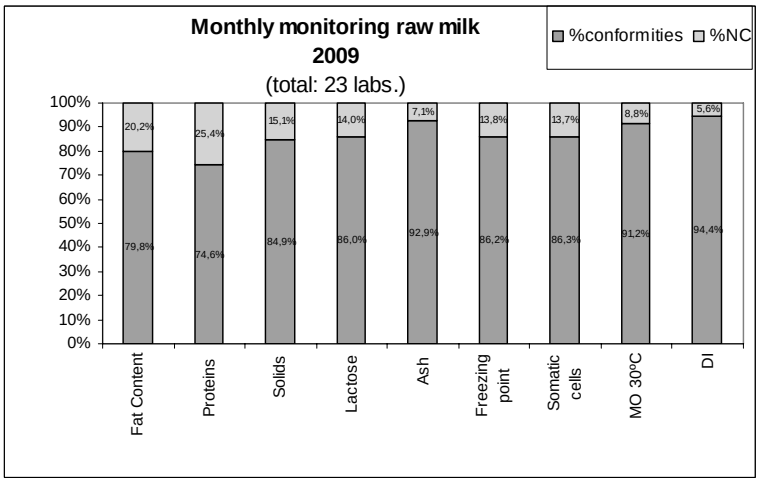
Annex 6



Annex 7



Annex 8



Annex 9

Check-list de la determinación de composición de leche por IR (FIL IDF 141C:2000) Versión 12.04.2010

			SI	NO	OBSERVACIONES
1. Recepción muestra					
¿Es adecuada la temperatura de recepción de la muestra? (menor a 12ºC)					
¿Se encuentra en buen estado? (no está cortada,derramada,etc)					
¿Esta cerrado herméticamente el envase?					
Conservantes	¿Se utilizan?				
	¿Dicromato de potasio (0,1% p/p)?				
	¿Azida sódica (0,03% p/p)?				
	¿Bronopol (entre 0,02 y 0,06% p/p)?				
	El equipo utilizado, ¿se ve influenciado por el agregado de conservante? ¿Está validado?				
2. Almacenamiento de la muestra					
¿Se almacenan las muestras refrigeradas hasta que se realiza el análisis?					
¿Se establecen tiempos máximos de almacenamiento hasta realizar el ensayo? ¿Se respetan?					
3. Condiciones ambientales					
¿Están establecidas las condiciones ambientales para la realización del ensayo?					
¿Se miden y controlan las condiciones establecidas? (temperatura, humedad, etc)					
4. Equipos y material de laboratorio					
¿Se cuenta con el equipamiento necesario de acuerdo a la norma?¿Alcanza la exactitud requerida por el método?					
¿Está identificado unívocamente?					
¿El laboratorio cuenta con instructivos para el uso y mantenimiento de los equipos?					
Soluciones de limpieza	¿Se chequea su vencimiento?				
Baño de agua	¿Es capaz de ser mantenido a (40 ± 1ºC)?				
	¿Se lo mantiene con agua destilada, limpio?				
	Calibración termómetro	¿Está calibrado?			
		¿Se cumple el plan de calibraciones?			
		¿Se utiliza la corrección especificada en el informe de calibración?			
		¿Se verifica que cumpla con la tolerancia de la norma?			
		¿Se utilizan la corrección y la incertidumbre, especificadas en el informe de calibración, para calcular el rango de trabajo del termómetro?			

6.0 References

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