
Reference system and centralized calibration for milk recording testing in Argentina

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Milk production in Argentina was over 10 billion liters in 2006. This figure positions the country in the 11th place in the ranking of world milk producers, and in the 2nd as regards Latin America. There are 2.5 million dairy cows, most of them pertaining to *Holando-Argentina* breed, producing approximately 4 000 liters of milk/cow/year. The Argentine dairy industry is geographically distributed all over the country. Five provinces making up the so-called Pampeana Region produce 94% of the milk in a surface area of 800 000 square kilometers. The country has 14 000 dairy farms and 1 100 dairies of different sizes where milk products are manufactured. This milk is mainly used in the production of cheese (45%); milk powder (24%); pasteurized and sterilized fluid milk (19%) and other products.

The “*Holando- Argentina*” breed was introduced into Argentina from Holland in 1880. These cows are medium sized with the height of 1.40 to 1.5 meters, having a large barrel allowing them to have a high intake of forage. In 1944, breeders create an organization to promote the breed and to provide necessary technical support named *Holando- Argentina* Breeders Association, ACHA. In 1981, the government (Department of Agriculture) delegate by law the “*official dairy herd improvement*” system in ACHA. The breeder association is a full member of ICAR in 1991 and subscribed an agreement with INTI, the National Institute of Industrial Technology in 2003, for the creation of a technical assistance and control laboratory network that began to work the follow year, committing DHI laboratories to participate in proficiency testing schemes under REDELAC, the network of INTI.

Since early in the 20th Century milk producers in the Argentine Republic started to control their cows’ production with the purpose of improving cattle quality. Nowadays we have: 2 000 dairy farms in “official milk control”, 510 000 cows under this system, 11 DHI laboratories that analyze the composition of the milk and a reference national laboratory that control the performance of DHI laboratories. Tests carried out include milk fat and protein content, and somatic cell count.

Introduction

Milk control in Argentina

Testing laboratories for milk recording

There are currently 11 laboratories conducting tests for official milk control in different provinces. Most of them are private and/or provincial laboratories, independent of producers or of the industry, supplying services to the milk chain, essentially as regards milk control, milk payment according to quality standards and other process control tests. Testing laboratories are distributed in different provinces according to the list in table 1.

On a monthly basis, results obtained at these laboratories participate in control schemes with the National Reference Laboratory namely INTI-LÁCTEOS who has, jointly with ACHA, the mission to supervise the laboratories supplying services to Official Milk Control Entities, as well as to provide technical support in equipment calibration and training the corresponding human resources.

National reference laboratory

INTI LÁCTEOS is the laboratory appointed by ACHA as the reference laboratory, with vast experience in technical assistance to milk labs; it is also the supplier of interlaboratory trials and reference materials. In turn, and complying with ICAR instructions, ACHA has requested the inclusion of INTI Lácteos as the national reference laboratory (NRL) for Argentina in ICAR laboratory network.

INTI LACTEOS is the Technological Research Center for the Milk Industry and was created in 1968. It is one of the nearly 40 INTI centers, the National Institute of Industrial Technology, a decentralized entity depending upon the Argentine Ministry of Economy. INTI, among many other responsibilities, is the National Metrology Institute in Argentina.

Seventy five professionals and technicians work at INTI LÁCTEOS, providing consultancy and technical support to all links in the milk chain, and among them, to testing laboratories. The center is headquartered in the city of San Martín, in the province of Buenos Aires and in the city of Rafaela, in the province of Santa Fe. Its scope includes training, assistance, development, innovation and testing activities. INTI LACTEOS has laboratories for milk quality, physicochemical testing, microbiology, residues and contaminants, sensory evaluation, and others.

Table 1. List of milk testing laboratories operating for milk recording in Argentina.

Name	City	Province	Belongs to
Alecol	Esperanza	Santa Fe	Milk producers
Ceret	General Pico	La Pampa	Provincial state
Funesil	Villa María	Córdoba	Private
Insulab	Venado Tuerto	Santa Fe	Private
Labrolac	Las Varillas	Córdoba	Milk producers
Labvima	Trenque Lauquen	Buenos Aires	Private
Labvima	Villa María	Córdoba	Private
Lacle	Buenos Aires	Capital Federal	Private
Lever	Paraná	Entre Ríos	Provincial
Matco	Lujan	Buenos Aires	Private
Sancor	Sunchales	Santa Fe	Dairy Industry

In compliance with ICAR requirements regarding the mandatory character of maintaining certified quality systems, INTI Lácteos labs in Buenos Aires and Rafaela conduct analytical assessments, organize proficiency test programs and supply reference milk material pursuant to ISO 17025, ISO 43, ILAC G13, and ISO 34 systems, certified by the official Argentine Accreditation Body (OAA) and the National Accreditation Entity of Spain (ENAC).

Since 1991 INTI LÁCTEOS has also been the reference laboratory for REDELAC (www.redelac.gov.ar), a network of Argentine milk laboratories developed by INTI itself, whose purpose is to provide such laboratories with the tools to maintain their technical competence. Milk industry laboratories are included in this network; there are many of them with high technical competence, and some of food laboratories in general. INTI LÁCTEOS maintains a wide suitability testing program for different milk matrixes that has been accredited by ENAC since 10/15/04, through Certificate 001/PPI001. It has also developed a centralized calibration system for milk analysis instruments, called SICECAL, currently in the certification process under ISO 34 Standard.

Technical assistance and control of milk testing laboratories result from a wide experience in this field, where work has been done since 1991 in order to obtain homogeneity in results and maintain metrological traceability between the testing laboratory, the national reference laboratory and international labs.

Assistance consists in training actions, both in analytical tests subjects and in quality assurance subjects. Laboratory control is carried out through a scheme based on:

1. Centralized calibration.
2. Control of performance of laboratories.
3. An evaluation of the laboratories by an ACHA-INTI committee to ascertain its performance and to set the adequate corrective actions if required.

SICECAL is a system of preparation, analysis and delivery of reference materials in dairy matrix for calibration and control equipment. It is a widely used tool in Argentina to calibrate different types of analyzers used in milk laboratories. It consists in sending monthly standard samples for

- Calibration of infrared analyzers (fat, proteins, totals solids, lactose, ash).
- Adjustment of fluoro-opto-electronic equipment for somatic cell count.
- Calibration of milk cryoscopes.
- Others.

The use of these Reference Materials is not mandatory, and this is so since there are big laboratories that prepare their own materials.

This Reference Materials are produced in INTI Lácteos in Rafaela according the requirements of the guide ISO 35. For calibration or IR equipment, 11 and 5 samples of raw milk are sent in the first week of the month. Composition: fat: 2.50 to 5.00 g/100 ml, protein: 3.00 to 3.60 g/100 ml, lactose: 4.60 to 5.00, ash: 0.68 to 0.82 and dry matter content: 11.80 to 13.80. Milk composition is informed with the pertinent uncertainty. Participants receive a delivery schedule early each year.

Assistance and external control of milk testing laboratories

Centralized calibration system SICECAL

For adjustment of somatic cell equipments, 3 samples of raw milk are sent in the first week of the "pair" months. Composition: "low" somatic cells counting (170 000 cel/ml); "medium" (430 000 cel/ml); and "high" (700 000 cel/ml).

Samples are prepared with mixed raw milk. The reference value is obtained by IDF reference methods in quadruplicate. There are checks of the reference value (named "previous SICECAL") where the laboratory test the value in four (4) IR-equipment or SC-equipment in other recognized laboratories. Test of homogeneity and stability are performing according to the requirements in guide ISO 35. With these samples, laboratories calibrate, re-calibrate, verify or adjust testing equipment.

**Performance
assessment of DHI
laboratories**

The control of performance of DHI laboratories is carried out through two types of actions:

- *Monthly check* of results of laboratories. Every second Tuesday of the month, (one week after centralized calibration), laboratories receive one sample to analyze fat, total proteins and somatic cells count by their routine methods. They are obliged to send results in time to INTI Lácteos.
- *An Bi-annual interlaboratory trial*. Each six month, the laboratories receive 10 samples to analyze fat, total proteins and SCC. They must submit results in time to INTI Lácteos.

In the monthly check DHI laboratories receive one blind sample for each parameter to check, to be analyzed in a period of time. The comparison of results with INTI Lácteos permit assures the suitability of the equipment to conduct milk control tests. Samples are prepared with mixed raw milk. Composition: 2.5-4 % of fat, 2.8-3.5 % total proteins, 100 000 700 000 SCC, and others. Test of homogeneity and stability are performing according ISO 13528 standard. Usually, as these laboratories also analyze samples for milk payment purpose, they also receive additional samples to check the results of other milk quality parameters (antibiotic residues, bacteria total count and freezing point). It is interesting to remark that logistics for sending these samples is not a minor topic, since samples have to arrive at laboratories in time and good state of preservation.

Results of laboratories are compared against the reference value obtained by INTI Lácteos in Buenos Aires by using IDF reference methods, and applying an ISO 17025 quality system accredited by the OAA. The reference value must be not statistically different of the robust media (26 laboratories nowadays). If yes, the NRL studied the reason and decide which reference will be use. Next, a results report is issued where it is shown whether results obtained for each test are comparable to results obtained by NRL, the performance of the latest 12 month of the laboratory and a comparison of the laboratory with the other laboratories participating in the PT scheme.

In the bi-annual interlaboratory trial, laboratories must participate in a proficiency test where 10 samples with variable percentages of fat, protein, lactose, total solids content and somatic cell count are sent. This inter-comparison scheme is improved under an ISO 43 / ILAC G13 quality system accredited by ENAC. The NRL send 10 different samples for each component. They are prepared with raw milk as IDF Standard 141:2000 by separation and recombination of components. The composition is: range of 2.5-4 % for fat; 2.5-3.5 % for total proteins; and 100 000-700 000 for SCC. Test of homogeneity and stability are performing according

ISO 13528. The reference value is obtained by consensus of all laboratories, calculating robust media. INTI Lácteos analyze also the samples by IDF reference methods, in duplicate, to assure results.

The results of these reports are analyzed by an INTI-ACHA Advisory Committee created within the framework of the technological linkage agreement subscribed by both institutions. This advisory committee hold meeting every two month and decides the actions to follow according the evaluation of each laboratory.

The reference system for milk recording testing in Argentina is based on the action of a national reference laboratory and DHI dairy laboratories, which interchange information, technical assistance and control mechanisms. The characteristics of our country and our milk permit a centralized calibration of testing equipment and a frequent control of milk recording testing laboratories. At a time, the NRL check your own performance by means of PT schemes with international institutions. These metrological scheme permit Argentina maintain a good traceability between laboratories and international institutions by means of inter-comparisons. This characteristics show a metrological system for milk measurements according the importance of the argentine dairy industry.

Evaluation of results

Conclusion
