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Raw and Pasteurised Milk Analysis

Milk is considered one of the completest, basic elements for human nutrition in addition to being the only food for mammals during the early stages of infancy. The substances in milk provide it with the energy and fundamental structural materials for the growth of any species. Due to its complete composition (proteins, fats, carbohydrates, etc.), its high digestibility and ease for the human body to take advantage of all its nutrients, as well as its flavour and wide possibilities in the making of other food products, milk and dairy products are essential foods to meet the nutritional needs of humans at any age.

Some of its most important physical properties are:

- Density: 1.028 - 1.034 g/ml
- Freezing point: between -0.53°C and -0.56°C
- pH: between 6.6 and 6.7

There are several established methods for the chemical-physical analysis of milk and milk derivatives, such as the protocols for analytical procedure. This leaflet summarises several analytical well-accepted determinations, very useful for carrying out the technological process.

The regulations taken into account establish the minimum mandatory controls that economic operators linked to the production of raw cow's milk must carry out throughout all production stages, so that all operators and laboratories in the dairy sector act in a homogeneous manner. As such, common standards are established for taking samples and analysis, and the conditions required for analysis laboratories, are defined in order to achieve greater transparency in the relationships between the agents comprising the production chain and marketing, providing greater safety and confidence for the consumer.

In this document, Scharlab seeks to gather all the reagents and materials necessary for the different analyses and determinations required in raw and pasteurised milk quality controls, classified into Chemistry, Microbiology, Glassware, Consumables and Equipment. They are ordered by determination and/or analysis. Additionally, a brief summary of each of the required determinations is included.

Raw Milk

Raw milk is milk from cows, goats, sheep, or other animals which has not been pasteurised. It is not available to the public for safety reasons. Digesting raw milk involves dangers, the most important being that without the pasteurisation process it can contain bacteria. These pathogens mean people can fall ill, especially those with weak immune systems, including children, pregnant women and the elderly.

Acidity

Acidity in milk is understood as being the apparent acid content, expressed in grams of lactic acid per 100 ml of milk.
The total acidity of a type of milk is determined by volumetry or titration. What is intended is the saturation of milk acid functions by an alkaline product which, in the presence of an indicator reagent and by means of a colour change, neutralises the acid.

ACIDITY			
	Art. No.	Description	Pack
Chemistry*	SO1004	Buffer solution pH = 4,00 (20°C)	–
	SO1007	Buffer solution pH = 7,00 (20°C)	–
	FE0496	Phenolphthalein, solution 1% in ethanol, indicator	–
	SO0429	Sodium hydroxide, solution 1/9 mol/l (1/9 N), according to Dornic	–
Glassware	1033510108	Beaker, low form, graduated, 250 ml	10 u.
	073-06300V	Glass rod, 300 mm, Ø 6 mm	10 u.
	073-991719	Graduated pipette, 5 ml, Class AS	5 u.

Cryoscopic Point

This is the freezing point. Its determination constitutes one of the most exact procedures to find out the possible adulteration of milk with water.
Adding water to milk alters its freezing point by diluting the concentrations of the compounds dissolved in it. The drop in the freezing point is proportional to the concentration of solutes in the water. In this way, the addition of water causes a decrease in the concentration of solutes and an increase of the cryoscopic point.
The freezing point of milk ranges from -0.530°C to -0.560°C, and is determined by the concentration of lactose, chlorides and other mineral salts it contains, and is lower than the freezing point of pure water (0°C).

CRYOSCOPIC POINT			
	Art. No.	Description	Pack
Glassware	073-991719	Graduated pipette, 5 ml, Class AS	5 u.
Consumables	630FL60-04	Sterile flask for milk samples, 50 ml, Gosselin	650 u.
Equipment	AST-067699	CryoSpecial 1 cryoscope, Astori Técnica	1 u.
	AST-067799	CryoTouch 1 automatic cryoscope, Astori Técnica	1 u.
	AST-067899	CryoTouch 20 automatic cryoscope, 20 samples, Astori Técnica	1 u.
	AST-067863	CryoTouch 40 automatic cryoscope, 40 samples, Astori Técnica	1 u.
	AST-067205	Calibrated glass sample tubes, 2/2,5 ml, Astori Técnica	12 u.

Proteins

There are two widely recognised methods for the determination of protein in milk:

The Sorensen Walker Method

This technique determines the protein content in milk by acid-base titration. After the addition of formalin to the sample, the formaldehyde binds to the amino groups of the amino acids of the proteins leaving the free carboxyl groups. This produces changes in the titratable acidity of milk, being titrated with sodium hydroxide. The amount of sodium hydroxide used in the neutralisation determines the amount of protein present in the sample.

The Kjeldahl method

In this technique, proteins and other organic components of milk are digested in a mixture with sulphuric acid in the presence of catalysts. Total organic nitrogen is converted by this digestion to ammonium sulphate. The digested mixture is neutralised with a base and subsequently distilled. It is collected in a boric acid solution, and the remaining ammonia titrated.

PROTEINS			
Sorensen Walker Method			
	Art. No.	**Description**	**Pack**
Chemistry*	FO0011	Formaldehyde, solution 37% w/w, for analysis, ExpertQ®, stabilised with methanol	–
	FE0496	Phenolphthalein, solution 1% in ethanol, indicator	–
	SO0443	Sodium hydroxide, solution 0,1 mol/l (0,1 N)	–
Glassware	0033527305	Erlenmyer flask with narrow neck, 100 ml	1 u.
	073-991720	Graduated pipette, 10 ml, Class AS	5 u.
	073-991719	Graduated pipette, 5 ml, Class AS	5 u.
	073-001521	Straight burette, conical PTFE stopcock, 25 ml	1 u.
Kjeldahl Method			
Chemistry*	AC0579	Boric acid, solution 4% w/v	–
	AC0741	Hydrochloric acid, 37%, for analysis, ExpertQ®, ACS, ISO	–
	AC0746	Hydrochloric acid, solution 0,1 mol/l (0,1 N)	–
	IN0040	Mixed indicator I, for determination of sulfurous gas (SO2), according to Paul	–
	PO0365	Potassium sulfate, for analysis, ExpertQ®, ACS, ISO	–
	SO0425	Sodium hydroxide, pellets, for analysis, ExpertQ®, ACS, ISO	–
	AC2069	Sulfuric acid, 95-97%, for analysis, ExpertQ®, ISO	–
	AC3132	Trichloroacetic acid, for analysis, ExpertQ®, ACS	–
Glassware	0033527308	Erlenmeyer flask with narrow neck, 250 ml	1 u.
	4506616100	Glass culture tube KG-33, 12 ml, with screw thread, Kleinfeld	72 u.
	073-06300V	Glass rod, 300 mm, Ø 6 mm	10 u.
	073-201753	Graduated glass cylinder, 100 ml, Class A	2 u.
	073-991717	Graduated pipette, 2 ml, Class AS	5 u.
	073-991719	Graduated pipette, 5 ml, Class AS	5 u.
	073-001520	Straight burette, conical PTFE stopcock, 10 ml	1 u.
	073-001362	Tecator digestion tube, 250 ml	1 u.
Consumables	033-065.04	Dispenser. 2.5-25 ml range. GL45 thread. Adapter GL: 32, 38, 40	1 u.
	3102000BOC	Double spatula, stainless steel. 9x185 mm, Bochem	1 u.
	630FL60-04	Sterile flask for milk samples, 50 ml, Gosselin	650 u.
	0194005091	Tube rack, 20 places, Selecta	1 u.
	0010313032	Weighing boats for Kjeldahl, grade 609, Whatman	100 u.
Equipment	0194000629	Digestion block Bloc-digest, 6 places, Selecta	1 u.
	6709392010	Digital burette Solarus, 10 ml, Hirschmann	1 u.
	209-CR870G	Ductless fume hood. Model: 870. 800x1030x600 mm. 48 dB, Cruma	1 u.
	0209-ABEKD	Filters for extraction cabins for gases and vapors type ABEKD, Cruma	1 u.
	0194000509	Heating block with 20 positions, for Ø 42 mm tubes, Selecta	1 u.
	0F20500011	Heating Magnetic Stirrer Arec, up to 1500 rpm, Velp	1 u.
	BCE223-1S0	Precision balance Entris II, Sartorius	1 u.
	AST-067600	Speedy Lab, automatic milk analyser for fat, proteins, lactose and dry matter, Astori Técnica	1 u.

Non-fat dry matter

The non-fat dry matter (NFDM) is calculated by the difference between the dry extract percentage and the fat percentage determined from the same milk sample.
In the case of whole milk, the NFDM values must be above 8.2%.

NON-FAT DRY MATTER			
	Art. No.	Description	Pack
Glassware	073-991719	Graduated pipette, 5 ml, Class AS	5 u.
Consumables	011-033D/3	Porcelain incinerating dish, low form, 10 ml, Haldenwanger	1 u.
Equipment	00ABS80-4N	Analytical balance ABS 80-4N. Capacity of 80 g, Kern	1 u.
	0005042646	Basic Mini Desiccator. Volume 6.2 l (221x183x214 mm), Bola	1 u.
	AST-067600	Speedy Lab, automatic milk analyser for fat, proteins, lactose and dry matter, Astori Técnica	1 u.

Somatic cells

Somatic cells are the body's own white cells that serve as a defence for the cow's mammary gland against pathogenic organisms. The somatic cell count in milk is an indicator of the general health of the mammary gland of the lactating female, which is widely used for quality improvement in milk production.
Under normal conditions, with respect to the health status of the udder, the number of somatic cells in the mixed milk must not exceed 200000-250000 cells/ml.

SOMATIC CELLS			
	Art. No.	Description	Pack
Chemistry*	AZ0203	Methylene blue, C.I. 52015, EssentQ®	–
	XI0055	Xylene, mixture of isomers, for analysis, ExpertQ®, ACS	–
Consumables	027D102222	Glass cover slip, 22x22 mm, Deltalab	5 x 200 u.
	027D100001	Glass slide with unpolished edges, Deltalab	50 u.
	630FL60-04	Sterile flask for milk samples, 50 ml, Gosselin	650 u.
	000P1000-1	Universal pipette tip, 100-1000 µl	1000 u.
Equipment	0100403771	Binocular microscope BA210E, Motic	1 u.
	00LH729070	Mechanical pipette, 100-1000 µl, Sartorius	1 u.
	AST9000200	NucleoCounter® SCC-100 somatic cell counter, Astori Técnica	1 u.
	AST9410008	SCC-100 cassette, 100 pieces in 10 bags, Astori Técnica	100 u.

Antibiotics

The presence of antibiotic residues generates an alteration in the composition and organoleptic characteristics of milk, which consequently leads to a loss in food safety.
The aim of this test is to prevent the appearance of antibiotics in milk. There is often milk from multiple farms in the same tanker, so these tests are an effective approach before unloading.

ANTIBIOTICS			
	Art. No.	Description	Pack
Consumables	PPP0110001	Graduated plastic Pasteur pipettes, sterile, 5 ml	500 u.
	0068018025	Antibiotics detection test in milk, Delvotest SP Mini-NT, Bioser	25 u.
Equipment	AST-065486	ThermoSmart dry incubator, 10 samples, Astori Técnica	1 u.

Density

Density is a magnitude referring to the mass contained within a certain volume, and it can be used in absolute or relative terms. The normal density of milk ranges from 1.028 to 1.034 g/ml. As the percentage of water increases, its density decreases. As with the cryoscopic point, the density of milk indicates whether it has been adulterated with water.

DENSITY			
	Art. No.	Description	Pack
Equipment	073H841080	Lactodensimeter, density meas. range 15-40. Type Quevenne, with thermometer, 270 mm, Amarell	1 u.

Fats

To determine the fat in milk, the fat must be measured once it has been separated from the rest of the components, after destroying its globular state or by extracting it using a solvent.
The Gerber Method is used to determine the fat released. It is a routine, fast and accurate volumetric technique that is based on measuring the volume of the fatty phase separated from the aqueous one by centrifugation in specially calibrated devices.
The fat content is expressed as a percentage per 100 ml of milk.

FATS			
Gerber Method			
	Art. No.	Description	Pack
Chemistry*	ME0376	Isoamyl alcohol, for analysis, ExpertQ®, ACS	–
	AC2064	Sulfuric acid, solution 90-91% w/w, for Gerber fat determination in milk	–
Glassware	073E001592	Kipp dispenser with Erlenmeyer of 10 ml	1 u.
	073E001586	Kipp dispenser with Erlenmeyer of 1 ml	1 u.
	073-001729	Volumetric pipette, 11 ml, for milk	1 u.
Consumables	0191025412	Rack for butyrometers, stainless steel, 12 holes, 200x70x165 mm, Selecta	1 u.
Equipment	AST-067600	Speedy Lab, automatic milk analyser for fat, proteins, lactose and dry matter, Astori Técnica	1 u.
	AST-067116	Universal waterbath AstorBath for butyrometers, Astori Técnica	1 u.
	ASTPB67116	Stainless steel holder for 24 butyrometers, Astori Técnica	1 u.
	CO67116A02	Stainless steel lid, high shape, for ASTPB67116 holder, Astori Técnica	1 u.
	AST-060356	Digital Geber centrifuge Astor 8 Digit, 8 butyrometers, Astori Técnica	1 u.
	AST-060350	Multi-method centrifuge Astor Multi (Gerber, Babcock, Mojonnier, solubility/sedimentation, separation), Astori Técnica	1 u.
	158-003670	Gerber Centrifuge Mod. 3670, 8 Butyrometers, Funke Gerber	1 u.

Sampling

In this section, the ISO 707 Regulation for milk and dairy products (Guide to Sampling Techniques) applies. The recommended minimum quantity for each sample is 0.5 l or 0.5 kg.

SAMPLING			
	Art. No.	Description	Pack
Consumables	TP0114000R	pH indicator paper on a roll, pH 1-14	1 u.
	630TP30007	Polypropylene sterile screwed flask, 40 ml, Gosselin	1000 u.
	05393-7001	Sampling Tube DispoDipper SteriPlast®, 50 ml, Burkle	20 u.
	0198092902	Steel jug with handle, rim and spout, 250 ml, Selecta	1 u.
	000P1000-1	Universal pipette tip, 100-1000 µl	1000 u.
Equipment	00LH729070	Mechanical pipette, 100-1000 µl, Sartorius	1 u.

Mycotoxins

Mycotoxins are metabolites produced by molds that can cause pathological changes in humans and animals.
The mycotoxins present in milk can come indirectly from foods that the cow has ingested (aflatoxin M1, M2, B1 or B2), or directly from the growth of molds on the milk, capable of producing mycotoxins.
The absence of these metabolites must be ensured.

MYCOTOXINS			
	Art. No.	Description	Pack
Equipment	AST-002500	RDS-2500 Strip Reader, Astori Técnica	1 u.
	AST-0M1-96	Quick Afla M1 Strip Test, for Aflatoxin M1 in milk, 96 test, Astori Técnica	96 u.

***Consult capacities and packagings available.**

Pasteurised milk

The pasteurisation process consists of a heat treatment for milk to eliminate the bacteria in it. This process needs to be calculated carefully to eliminate any infectious agent, while maintaining the properties and quality of milk.

For pasteurisation, milk is brought to a temperature that ranges between 55°C and 75°C for 17 seconds.

Alkaline phosphatase and peroxidase

Alkaline phosphatase is an enzyme present in raw milk and progressively inactivated by heating to temperatures above 60°C. Normal low and high pasteurisation temperatures for milk inactivate it. For this reason it must be absent in a properly pasteurised milk.
The presence of phosphatase indicates that: either milk has not been subjected to a correct pasteurisation treatment; or it has been contaminated with unpasteurised milk.
Peroxidase has a higher heat resistance than phosphatase. The European directive 92/46 (1992) uses this enzyme to determine the intensity of the pasteurisation treatment, establishing that pasteurised milk must have a negative reaction to phosphatase and a positive reaction to peroxidase.

ALKALINE PHOSPHATASE			
	Art. No.	**Description**	**Pack**
Glassware	0033510108	Beaker, low form, graduated, 250 ml	1 u.
Consumables	001-090612	Milk alkaline phosphatase strip kit, Macherey-Nagel	50 u.
	AST-063098	Perossitest Kit, approx. 150 tests	1 u.

Microbiology

This section is governed by ISO 21528 Regulation, which establishes a horizontal method for the detection and enumeration by means of the method for the most probable number of Enterobacteriaceae.
This procedure is applicable to pasteurised milk and liquid dairy products.

MICROBIOLOGY			
General			
	Art. No.	**Description**	**Pack**
Glassware	124-16160B	Glass test tubes, 20 ml, Ø16 mm, 160 mm	250 u.
Consumables	PPP0110001	Graduated plastic Pasteur pipettes, sterile, 5 ml	500 u.
	PSC0603001	Specimen container made of polypropylene, sterile, 60 ml, with wrapped cap	400 u.
	PIL0030120	Sterile inoculation loop, 1 µl, made of PS	1000 u.
	PPD-90143E	Sterile petri dish, Ø 90 mm with 3 vents	480 u.
	000P5202-1	Universal pipette tip, 5-200 µl	1000 u.
Equipment	00LH729060	Mechanical pipette, 20-200 µl, Sartorius	1 u.
Enterobacterias			
Microbiology**	02-277-500	Buffered Peptone Water (ISO)	500 g
	06-077-100	Glucose Oxidation/Fermentation Fluid Medium Base	100 ml
	01-635-500	Nutrient Agar (ISO)	500 g
	06-120-050	Oxidase reagent, swabs	50 u.
	01-295-500	Violet Red Bile Dextrose Agar (VRBD Agar) (Eur. Ph.)	500 g

****Other presentations and packaging available.**

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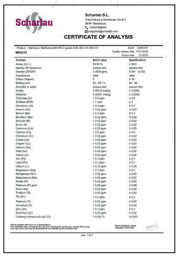
Scharlab Reader App lets you obtain technical documents and mini safety labels by simply scanning the QR code on your Scharlau bottle.

Minilabels (in 9 languages)

Documentation



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scharlab.com

Scharlab S.L.
Gato Pérez, 33. Pol. Ind. Mas d'en Cisa.
08181 Sentmenat, Barcelona, Spain
Tel.: +34 93 715 19 40 - Fax: +34 93 715 27 65
E-mail: helpdesk@scharlab.com

Scharlab Italia S.r.l.
Via Massimo D'Azeglio 20
26900 LODI (LO)
Tel.: +39 02 9823 0679
E-mail: customerservice@scharlab.it

Scharlab Philippines, Inc.
4/F Unit K, No. 35 Sto. Niño Street corner Roosevelt Ave.
Barangay San Antonio, Quezon City 1105, Philippines.
Tel. - Fax: + 63 2 529 5726
E-mail: infophilippines@scharlab.ph

Scharlab Brasil S/A
Estrada do Campo Limpo, 780.
São Paulo. 05777-000, Brasil
Tel.: (11) 5512 5744 - Fax: (11) 5511 9366
E-mail: mkt@scharlab.com.br

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