



Quality Control
and Safety Testing
in Dairy Production

Simplifying Progress

SARTORIUS

The Importance of Testing in Dairy Production

Quality control and testing is crucial in food manufacturing as it determines whether the end product is safe for consumption. This is especially important in a sensitive industry such as dairy production. The dairy industry has evolved with increased awareness

in how dairy quality is able to impact a product's nutritional value, taste and safety. Thankfully, there are testing methods available to assess the quality and safety of dairy products.

Sartorius is a trusted laboratory partner with decades of expertise in food and beverage testing, providing a range of analytical instruments and consumables to help promote the quality and safety of the dairy industry.

Types of Dairy



Milk (liquid)

Pasteurized, sterilized, fortified, fermented



Milk (powdered)

Whole, skim, part-skim, fortified, bovine colostrum



Other Dairy Products

Condensed milk, cream, cheese, etc.

Production Process of Dairy Products

Milk (liquid)

Pasteurized milk: Raw milk → Filter/Clarify → Store (Refrigerate) → Standardize → Homogenize → Pasteurize → Cool → Fill into packaging → Store (Refrigerate)

Milk (powdered)

Wet method: Raw milk → Filter/Clarify → Store (Refrigerate) → Standardize → Homogenize → Pasteurize → Concentrate → Spray dry → Sieve → Air-dry → Package
Dry method: Raw powder weighing → Inner packaging cleaning → Sterilize → Pre-Mix → Mix → Package

Other Dairy Products

Condensed milk: → Raw milk → Filter/Clarify → Store (Refrigerate) → Standardize → Pasteurize → Vacuum concentrate → Crystallize → Package

Safeguard your dairy product by controlling the presence of potential contaminants

Microbiological Contaminants

Pathogenic microorganisms and toxic metabolites

Chemical Contaminants

Pesticides, drug residues, aflatoxins, environment pollutants (e.g. Heavy metals etc.)

Physical Contaminants

Foreign matter unintentionally added into the production process (e.g. Metals, glass, animal hair etc.)

Sartorius provides a variety of solutions for quality and safety checks in dairy production

Raw Milk Collection



Production and Processing



End Product Quality Control

Raw Milk Collection

The final quality of a dairy product is heavily influenced by the quality of the raw milk collected. Therefore, assessing the quality of raw milk is particularly crucial. Local regulatory authorities would typically recommend that dairy manufacturing plants establish effective control procedures for the purchase and inspection of raw milk.



Sample Preparation for Accurate and Reliable Chemical Contaminant Analysis

High-performance liquid chromatography (HPLC) and liquid chromatography-mass spectrometry (LC-MS/MS) are analytical methods often used in the detection of pesticide residues, antibiotic residues, heavy metals and illegal additives (e.g. Melamine, plasticizers etc.) in dairy products. In order to obtain accurate and reproducible test results, samples must be adequately prepared before they can be analyzed. Sartorius offers best-in-class analytical sample preparation solutions, enabling the effective clean up of samples while maintaining reproducibility and producing interference-free results.



Arium® Ultrapure Water Purification Systems



Cubis® II Balance Series



Tacta® Pipettes and Tips



**Minisart® Syringe Filters
Claristep® Syringeless Lab Filtration Device**

1 Solvent Preparation

- Modular design. Customizable to your needs.
- Consistent water quality - Meets or exceeds ASTM Type 1 ultrapure water standards, helps improve analytical sensitivity.
- Simple and quick operation.
- Touch Screen functionality with intuitive menu navigation. Set a "favorites" menu for quick access to commonly dispensed volumes.

2 Standard Weighing

- Various concentrations of standards are often prepared and plotted to a curve when performing quantitative HPLC. Sartorius offers a wide range of ultramicrobalances, microbalances, analytical balances and precision balances for the accurate weighing of standards and samples, customizable to your application needs.
- Further simplification of the standards preparation process may be achieved with semi-automation on the Cubis® II series of balances with the Q-App software.

3 Reliable Pipetting

- Excellent ergonomic design. Ensures comfortable and effortless operation.
- Easy to clean. Can be autoclaved without disassembly.
- Obtain reliable results. Optilock feature prevents accidental volume changes during pipetting.

4 Sample Filtration

- The Minisart® range of syringe filters guarantees minimum extractables and low adsorption of analytes while maintaining high flow rates through the membranes.
- The Claristep® syringeless lab filtration device enables time savings by allowing clarification of up to 8 samples simultaneously without the use of syringes, a vacuum source or power supply. Filtered liquids are directly collected in your choice of 12 x 32 mm vials.

Discover More 

Simplify Culture Media Preparation with Accurate Weighing and Flexible Software Applications

Raw milk is known to be highly rich in nutrients. This however, also makes it a good breeding ground for microorganisms, making it particularly susceptible to microbial contamination and milk spoilage. Typical microorganisms that contaminate milk are bacteria or pathogenic bacteria, molds and yeast (e.g. *Staphylococcus aureus*, *Large intestine bacillus*, *Listeria*, *Salmonella*, etc.). Pathogenic bacteria in particular, can be dangerous. The detection of microbial contamination is often performed using methods like plate counting or serial dilution. Large amounts of culture media is often required for the cultivation of microorganisms when performing these tests. For manual preparation of culture media, accurate weighing of raw materials is crucial in ensuring batch to batch consistency.

A quantum leap in features, with upgrades in connectivity, weighing performance and sustainability, the Sartorius Quintix® Pro balances fit in any laboratory. It has ability to deliver the performance you need, built with added premium features that raise the bar in usability and flexibility, all in an eco-friendly design.



Dairy Production Process

During dairy production and processing, assessing the nutritional composition levels as well as testing the presence of additives and various pollutant residues are important and need to be carried out in accordance with local national standards. This testing process needs to be performed quickly in order to avoid delay if any adjustment in the production process is required. In addition to intermediate product testing, monitoring of the production environment is also crucial in ensuring minimal product contamination.



Rapid Assessment of Total Solids Content in Dairy Products

During the production of dairy products such as milk, milk powders, yogurt and ice cream, it is particularly important to measure their solid content levels as this determines the quality of the product. If the solid content level is found to be low in a certain batch of product, more solids may be added so that the product is able to meet the minimum level requirements. On the other hand, if the solid content level is found to be too high, water may be added to the product to adjust this value.

The LMA200PM microwave moisture analyzer is a cost-effective method to help determine the solid content of dairy products in a fast, accurate, and easy-to-use manner. It provides the following unique advantages for solid content level determination:

- Ultra-fast results in just 2 minutes. Avoid delays in making production adjustments
- Easy-to-use with superb accuracy. Test results conform to the standard oven-dry method. Direct sample measurement without complicated instrument calibration
- High precision and low variability. Typical standard deviations of 0.05% achieved

Sample	LMA200	Oven	Difference before correction	Corrected instrument value	Corrected Difference
Crispy bar outer shell	33.73	33.5	0.23	33.32	-0.18
Milk raisins	33.65	33.2	0.45	33.24	0.04
Crispy bar filling	33.91	33.4	0.51	33.51	0.11
Ice cream	34.72	34.5	0.22	34.36	-0.14
Milk wafer outer shell	33.75	33.1	0.65	33.34	0.24
Milk wafer filling	31.85	31.4	0.45	31.34	-0.06
Correlation Coefficient	0.99				

Solid content levels in various dairy products determined by the Sartorius LMA200PM moisture analyzer is completely consistent with the results obtained using the traditional oven-dry method.

Monitoring Microbiological Levels in the Air During Dairy Production

The requirements around microbial control of the dairy production environment states that the total number of bacterial colonies in the air of the production area should be below 30 CFU/dish. Production plants should ensure the air is sterilized and purified. Regular checks on air quality should also be performed on a weekly basis.

For the dynamic sampling of a specific volume of air, two methods are commonly employed: Gel membrane filtration (GMF) and BACTair agar plate impaction. Sartorius offers both solutions, depending on the application of interest. Both qualitative and quantitative results may be obtained by using different types of culture media.

The MD8 Airport Portable Air Sampler consists of an airborne bacteria sampler and a sampling head. To ensure reliable and accurate results, use this device with our gel membrane filters and our BACTair™ agar plates.

Advantages:

- Isokinetic air monitoring with extremely high retention rate for bacteria, viruses, spores and phages
- Optional on-site calibration for easy equipment maintenance



Download: Quantitative Detection of Bacteriophage Loads in the Ambient Air of Dairies



Microbiological Quality Control of Process Cleaning Water with Membrane Filtration



Milk and dairy products, being nutrient-rich, are susceptible to microbial contamination and spoilage. The water used in their processing can introduce microbes, affecting food safety. Therefore, cleaning of milk storage, cheese caves and transportation equipment is vital to reduce contamination and improve safety. The water used for cleaning should meet drinking water standards and its microbiological quality be assessed using indicator organisms linked to health risks.

The membrane filtration method is a well-established procedure for detecting microorganisms in cleaning water, ensuring reliable and reproducible results.

The Sartorius Microsart® membrane filtration system is designed to help simplify the filtration process.

Advantages:

- The equipment may be autoclaved in its entirety without disassembly, reducing the risk of secondary contamination in the environment.
- The integrated venting function of the Microsart® Manifold minimizes the risk of cross-contamination during filtration.
- May be used with the Microsart® family of funnels. Both re-usable and single-use options are available.



Final Product Quality Control

The final dairy product will need to be inspected batch by batch for the amounts and levels of protein, fat, immunoglobulin, moisture, lactic acid, total bacterial count, coliform bacteria type and other specifications.



Good Quality Pipettes and Tips Increase the Reliability of Your Results

To detect pathogenic bacteria (e.g. *Listeria monocytogenes* and *Salmonella*) in dairy products, methods like the plate count method using traditional petri dishes/films, molecular-based PCR and lateral flow assays may be performed very quickly and conveniently. Multiplex PCR may also be used for pathogen detection and identification.

Speed up the Process

The Picus® 2 range of electronic pipettes are equipped with Bluetooth connectivity, allowing users to connect to the Sartorius Pipetting mobile app, as well as integrate their pipettes to other existing systems. Sample preparation workflows and pipette management can be easily set up. Various pipetting modes are available, from dilution and titration to serial dispensing for quick and easy operation. Preset protocols may be saved, allowing users to focus on pipetting without having to manually change the volume or setting after every step, speeding up the process.

Avoid Cross-Contamination

Cross-contamination is a common problem in these experiments. This may be minimized using sterile filter tips. Safetyspace(R) filter tips allow more space between the sample and the filter compared to conventional filter tips and thus, helps lower the chance of samples coming into contact with the filter, minimizing sample cross-contamination.



Ultrapure Water for Trace Analysis

Formula milk is often fortified with minerals like calcium, iron, zinc, selenium, phosphorus, copper, manganese, etc. The detection of these elements in milk is often accomplished using atomic absorption spectroscopy. High quality ultra-pure water with low element content is required for this application when preparing samples and standards.

Sartorius Arium® water purification systems provides ultrapure water for trace metal analysis.

- Modular design. Build your own water purification system according to your application needs
- Consistent water quality. Meets or exceeds ASTM Type 1 standards, to help improve the sensitivity of the analytical results
- Simple and quick operation. Touch Screen functionality with intuitive menu navigation. Set a "favorites" menu for quick access to commonly dispensed volumes




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