

Because you care
about CONSUMERS' HEALTH



Food Fraud and Authenticity Service: Milk and Dairy

Products at high risk of food fraud

Milk and Dairy

Dairy products encompass a wide variety of products from milk, such as cheese, cream, butter, yogurt, etc. **Dairy products are among the most adulterated food products worldwide.** Milk itself, no matter from (cow, goat, sheep, buffalo) has become prone to fraudulent activity in recent years, due to the increase in the world demand, competition and the complexity of supply chains. **PDO** (Protected Designation of Origin) **cheese** is a very well-known example worldwide and one of the main characters of the Italian Sounding. Milk fat, **butter** in the first place, still experiences relatively high prices thus inducing substitution of milk fat by vegetable fats and fillers by fraudsters.

Most common frauds

Milk and Dairy



DILUTION: dilution of whole milk **with water** sold as whole milk.



FRAUDULENT HEAT TREATMENT: fraudulently **heat-treated** milk mixed with fresh milk and sold as such.



FOREIGN AND CHEAPER INGREDIENTS: adulteration of **milk** and dairy products with different **cheaper materials:** whey, starch, vegetable proteins and fats, artificial flavors. Examples are: adulteration of **butter** with vegetable lipids, **cheese** with foreign fats, cow's milk instead of buffalo's to produce «**Mozzarella di Bufala**», **A2 milk** mixed with cheaper A1 milk.



UNAPPROVED PRESERVATIVES AND ADDITIVES: **preservatives added to PDO cheese**, dangerous health substances like **melamine**, added to fraudulently enhance milk protein content (Chinese milk scandal, 2008).



EXTENSION OF SHELF-LIFE: milk and dairy products produced under poor hygienic conditions or stored for long time are sometimes **fraudulently heat-treated** or added with **microbial growth inhibitors** to break down the microbial load and extend shelf-life.



MISREPRESENTATION OF GEOGRAPHIC ORIGIN: **irregular or misleading use of voluntary indications** or designation of origin, with regard to **PDO products** in particular, are the most famous examples.



The challenge of fraud detection

Milk and Dairy

- Possible frauds in the dairy sector concern different kind of matrices that need to be **addressed specifically** according to their composition and structure.
- Being **animal-derived product**, it is very important to consider the **whole food chain** when dealing with fraud and authenticity, as many parameters like **food processing, animal feed**, etc., may interfere.

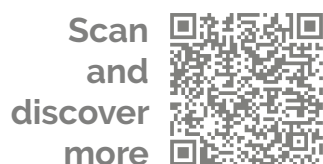
Our analytical service

Milk and Dairy

Mérieux NutriSciences offers a comprehensive analytical service for fraud detection in milk and dairy products. According to the specific need, different analytical approaches are used and combined together:

- **Sample-based:** targeted tests on single samples
- **Project-based:** specific design of the experimental protocol according to the fraud characteristics and customers' needs (targeted tests and non-targeted screening)

	ADDRESSED ISSUE	ANALYTICAL DETERMINATION	METHOD
SAMPLE-BASED	Counterfeiting of product specific characteristics	Detection of whey, sulphates, sodium chloride, protein quality, starch, antibiotics, etc.	HPLC, GRAVIMETRY LC-MS, GC-MS, Mineral Profile
	Dilution with water	Determination of freezing point, determination of water	Cryoscopy, Mineral Profile
	Fraudulent heat treatment	Determination of lactulose, furosine	HPLC
	Replacement with fat from other sources (butter)	Detection of vegetable oils and fats (sterols)	GC-FID
	Fraudulent enhancement of protein content	Detection of melamine, UREA, etc.	LC-MS/MS, HPLC-DAD
	Replacement with other species	Absence/presence of DNA species in the product	DNA Barcoding and Metabarcoding, Microarray, PCR
	Fraudulent extension of shelf-life	Detection of hydrogen peroxide, formaldehyde, salicylic acid, microbial growth inhibitors, neutralizers	HPLC-UV, microbiology, enzymatic
	Use of milk powder to produce mozzarella	Determination of furosine and lactulose	HPLC
	Non-PDO Parmigiano Reggiano labeled as PDO	Authenticity of PDO Parmigiano Reggiano	Targeted and non-targeted package of analyses
	A1 milk labeled as A2 milk	Determination of A1 milk into A2 milk	LC-HR/MS
PROJECT-BASED	Mislabeling of geographic origin and PDO designation	Food profiling and authenticity database (targeted/non-targeted)	Non-targeted metabolomics Isotopic Ratio Mass Spectrometry (IRMS) Near Infrared Spectroscopy (NIR) Fourier Transform Infrared Spectroscopy (FTIR) DNA barcoding and Metabarcoding
	Authenticity verification: naturalness, purity, maintenance of quality standards, etc.		



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