

# Dairy Food Fraud Primer

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The United States dairy industry is one of the safest food supplies in the world. The percentage of outbreaks in the United States due to issues of dairy foods has decreased from >25% in 1938 of all recalls to <1% in 2015 (Lucey 2015).

However, food fraud is an issue that the industry needs to keep in mind as work continues to ensure the safety and quality of dairy products. Dr. John W. Spink, assistant professor in the Department of Supply Chain Management in the Business College at Michigan State University, defines food fraud as the intentional deception of consumers for economic gain using food products. It is not intended to cause public harm.

Classification	Outcome	Intent
Food Quality	economic gain	unintentional
Food Fraud	economic gain	intentional
Food Safety	harm	unintentional
Food Defense	terrorism, widespread harm	intentional

The table above compares food quality, food fraud, food safety and food defense. One of the main points is that the motivation behind food fraud is that it is intentional and for economic gain.

## According to Spink, here are some of the common food fraud risks.

**Adulteration:** a component of the finished product is fraudulent or should not be present (i.e. melamine added to milk).

**Tampering:** a legitimate product and packaging is used in a fraudulent way (change expiry information, swapping out a high cost ingredient with a low cost one and not accurately reflecting this change on the label).

**Over-run:** legitimate product is made in excess of production agreements (under-reporting of production).

**Theft:** legitimate product is stolen and passed off as legitimately procured (stolen products are co-mingled with legitimate products).

**Diversion (or parallel trade):** the sale or distribution of legitimate products outside of intended markets (e.g. relief food aid redirected to markets where aid is not required)

**Smuggling:** genuine product covertly transported to avoid taxes, fees, or other restrictions.

**Simulation:** illegitimate product is designed to look like but not exactly copy the legitimate product ("knock-offs of popular foods not produced with the same safety assurances).

**Counterfeiting:** intellectual property infringement, which could include all aspects of the fraudulent product and packaging being fully replicated (e.g. copies of popular foods not produced with same food safety assurances).

## In the dairy industry, specifically, food fraud can take many forms. Dr. Rodrigo Ibáñez, CDR Associate Scientist, lists some of the food fraud risks that have surfaced in the dairy industry:

Replacement of an ingredient or constituent (e.g. milk fat replaced with vegetable oil)

Addition of non-authentic substance to mask inferior quality

Removing or intentional omission of an authentic and valuable constituent without the knowledge of consumers

### Milk fraud

- Addition of water to increase volume

- Addition of starch, flour and other non-dairy ingredients

- Addition of a lower cost milk (cow) into a high cost milk (e.g. goat, sheep, camel)

- Additions of an unapproved chemical to increase shelf-life (e.g. antioxidants)

Other ingredients and inclusions can also be the source of food fraud. Olive oil currently is a very high-risk item, with reports of sophisticated theft of oil, and selling stolen olive oil as well as mixing of different cheaper oils passed off as olive oil. The country of origin may matter as well and for some products it could increase the risk of food fraud and should be part of your assessment.

If your dairy product contains one of the ingredient types on the next page this may increase the risk of food fraud: herbs and spices, olive oil, foods labeled organic, honey and maple syrup, seafood, coffee and tea, wine and spirits and some fruit juices. ➔

## Top Food Fraud product categories

Honey & royal jelly
Live animals
Meat and Meat products
Fish and products thereof
Fats & oils
Poultry meat & poultry meat products
Dietetic foods, food supplements & fortified foods
Crustaceans & products thereof
Plant protection products
Cephalopods & products thereof
Fruit & vegetables
Non-alcoholic beverages
Feed materials
Confectionery coca & cocoa preparations, coffee & tea

While food fraud cases in the dairy industry are rare, if it occurs, the impact to brand reputation can be very damaging. It can result in economic loss, long-term damage to brand, and potential consumer health issues.

One recent dairy food fraud incident took place in Italy in 2021 when a milk hauler was found to be adding water to milk. The hauler was mixing water into the milk by means of a double bottom or hidden water tank on the truck. When the truck arrived at the plant, the milk was tested and found to be acceptable. Then, when it was time to pump the milk over in the plant's tanks, the hauler used an electronic button that controlled a pump that mixed water from the hidden tank with the milk (Casula, F. 2022).

Another recent example of food fraud occurred in Ireland and Great Britain when fake branded milk chocolate bars appeared on the market. This is an example of product counterfeiting that was an intellectual property rights infringement. The counterfeit chocolate bars were packaged using artwork and logos stolen from Wonka Bars and Prime brands. The fake branded chocolate bars posed many risks including the fact that they were possibly made or repackaged by unregistered business or criminals who may not have followed food safety practices when manufacturing or packaging the bars (Southey, F. 2024).

The good news is that due to the implementation of programs like the Pasteurized Milk Ordinance (PMO), the United States milk supply is at low risk of having food fraud issues. That said, the dairy industry is still required under law, as well as auditing schemes like the Global Food Safety Initiative (GFSI), to assess risk for food

fraud. It is the plant's responsibility to review suppliers, you are the expert on your suppliers and should assess the risk. Here is a guide to reviewing your risk and specific risks to keep in mind.

## RAW MILK

**Risk:** Addition of water to milk

**Mitigation:** Approved Supplier/ Trustworthy supplier of milk

**Potential Detection Strategies:** Cryoscope (milk freezing point analysis)

**Risk:** Use of non-milk substances to boost protein content

**Mitigation:** Approved Supplier/Trustworthy supplier of milk

**Potential Detection Strategies:** Detailed component testing

**Risk:** A2 versus A1 milk (claiming milk is A2 milk when it is actually A1)

**Mitigation:** Approved Supplier/Trustworthy supplier of milk

**Potential Detection Strategies:** Techniques like capillary electrophoresis can detect genetic protein variants

**Risk:** Substitution of higher value milk (Goat/Sheep) for lesser value (Cow Milk)

**Mitigation:** Approved Supplier/Trustworthy supplier of milk

**Potential Detection Strategies:** PCR (testing Cheese), Triplex-PCR (testing Cheese), Multiplex PCR assay (testing Cheese), Commercial ELISA (testing Cheese), MALDI-TOF MS (testing Cheese), RP-HPLC method (testing Cheese)

## CHEESE PRODUCTION

**Risk:** Ingredient fraud (i.e. spices, honey, olive oil, fish)

**Mitigation:** Supply Chain assurances, COAs, 2<sup>nd</sup> and 3<sup>rd</sup> party audits

**Potential Detection Strategies:** Various testing available

## CONVERSION

**Risk:** False claims (made in Wisconsin claims, European PDO)

**Mitigation:** Supply Chain assurances, COAs, 2<sup>nd</sup> and 3<sup>rd</sup> party audits

**Risk:** Standard of Identity (SOI) violations – Cheese being produced with components that aren't in alignment with the SOI (e.g. Cheddar having moisture >39%, etc.), and/or added ingredients that are unlabeled that violate the SOI laid out in 21 CFR 133

**Mitigation:** Approved Supplier Program, Supply Chain assurances, COAs, 2<sup>nd</sup> and 3<sup>rd</sup> party audits →

**Potential Detection Strategies:** Component testing (moisture, fat)

**Risk:** Converting and mixing imitation cheeses with standardized cheeses

**Mitigation:** Approved Supplier Program, Supply Chain assurances, COAs, 2nd and 3rd party audits

**Risk:** Too much of an approved ingredient added to increase volume: i.e. Cellulose in grated parmesan cheese

**Mitigation:** Approved Supplier

**Potential Detection Strategies:** Digital image analysis of shreds

## WHEY

**Risk:** Getting cheese made with palm oil or corn oil that are undeclared/unapproved additives

**Mitigation:** Approved Supplier

**Potential Detection Strategies:** Fatty Acid Testing, NMR Testing

## GENERAL LABELING

**Risk:** Organic claims

**Potential Detection Strategies:** Very difficult to find, 2<sup>nd</sup> and 3<sup>rd</sup> party audits, visits evaluating chemicals used, storage of materials, and ingredients.

For a meta-analysis on several different detection strategies, view this article: <https://go.wisc.edu/ta14g6>

Having a trustworthy supplier and good relationship goes a long way. Once you believe you need detection, your facility is not in a good place. Emphasize the importance of customer and 3<sup>rd</sup> party audits.

This article is intended to raise awareness of potential food fraud risks in the dairy industry. For more information regarding mitigation, testing and more, view the resources below or contact Alex O'Brien, CDR Dairy Safety & Quality Coordinator at [aobrien@cdr.wisc.edu](mailto:aobrien@cdr.wisc.edu) 🌟

## Resources:

CDR Food Fraud Short Course: [go.wisc.edu/v33hpu](https://go.wisc.edu/v33hpu)

Food Fraud Think Tank Primers: [go.wisc.edu/i301hu](https://go.wisc.edu/i301hu)

SSAFE Food Fraud Vulnerability Tool: [go.wisc.edu/Oda0zh](https://go.wisc.edu/Oda0zh)

Dairy Food Safety Alliance Food Fraud Vulnerability

Assessment Example: [go.wisc.edu/bjhra8](https://go.wisc.edu/bjhra8)

European Commission 2022 Annual Report Alert and

Cooperation Network: [go.wisc.edu/2gy03t](https://go.wisc.edu/2gy03t)

*Continued from page 5*

including Cathy Hart, Andrea Neu and consultant Mike Dean, were also instrumental in getting the program started.

True to Path's vision, the Wisconsin Master Cheesemaker program has helped support the continued growth of specialty cheese in the state. When the program started specialty cheese production was a small percentage of total cheese produced in the state. Today, Wisconsin produces almost a billion pounds of specialty cheese. In total, 48% of all specialty cheese made in the U.S. comes from Wisconsin.

A core tenet of the Wisconsin Master Cheesemaker program is continuing education and training for experienced cheesemakers. To apply for the program, cheesemakers need to have held an active Wisconsin cheesemakers license for a minimum of 10 years (among other requirements). If a cheesemaker is accepted into the program, it typically takes about three years to complete the training requirements (short courses), plant visits, and a comprehensive written exam. In addition, as the cheesemaker is working toward completing the program, their cheeses are tested to ensure they exceed standard expectations for the variety of cheese.

The Wisconsin Master Cheesemaker® program continues to expand with each new class. Since 1997, more than 100 cheesemakers have graduated from the program. That tradition continues today as the 2024 class of Wisconsin Master Cheesemakers will be honored April 18 in Milwaukee, Wisconsin. Watch for an article featuring the cheesemakers of the 2024 class in the next issue of the Dairy Pipeline.

For more information visit, [cdr.wisc.edu/master-cheesemakers/brown](https://cdr.wisc.edu/master-cheesemakers/brown) or [wisconsincheese.com](https://wisconsincheese.com) 🌟

## Sources:

Casula, F. and Milone, M. "Tank scam: truck with double bottom to stretch milk with water." *Il Fatto Quotidiano*. Feb 18, 2022. [go.wisc.edu/oc67va](https://go.wisc.edu/oc67va)

Gimonkar, S.; Van Fleet, E.E.; Boys, K.A. *Dairy Product Fraud*. Academic Press: Cambridge, MA, USA, 2021; pp. 249–279.

Lucey, J. *Raw Milk Consumption Risks and Benefits*. *Nutrition Today*. 2015. Jul; 50(4): 189–193.

Spink, J. and Moyer, DC, (2011) *Defining the Public Health Threat of Food Fraud*, *Journal of Food Science*, Volume 75 (Number 9), p. 57-63.

Southey, F. 'Prime makes drinks, not foods': Fake branded chocolate bars spark food safety warning. *Food Navigator*. January 8, 2024. [go.wisc.edu/uvb08b](https://go.wisc.edu/uvb08b)