

Challenges and Opportunities Faced by Cheese Manufacturing Mexican Micro, Very Small and SMEs

Arturo Inda-Cunningham*

Independent Consultant, Chihuahua, Mexico

***Corresponding Author:** Arturo Inda-Cunningham, Independent Consultant, Chihuahua, Mexico.

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Abstract

In 2016, Mexico produced 11,607 million liters of milk. 98.8% was bovine milk and 1.2% was goat milk. The country is one of the largest importers of Nonfat Dry Milk, with approximately 265,000 MT for 2016.

Goat milk is used to produce artisanal cheese (mostly soft, fresh, cheese made in rural areas by micro-enterprises using raw milk), milk candy spread, and other sweets. Unpasteurized soft goat milk cheese is ideal for the proliferation of pathogenic microorganisms and its consumption may cause brucellosis.

The main challenges faced by these micro-enterprises are: pasteurization of milk, adoption of conventional technologies, development of a culture of food safety and quality, insufficient training, lack of financing, inadequate communications infrastructure, constrained managerial capabilities and low labour productivity.

The main opportunities are: use of whey for products for human consumption, recovery of whey proteins to increase the yield of cheese, market expansion through pasteurization and innovation in new products, and assurance of food safety and quality from production to consumers.

Oaxaca, Panela, Sierra, and Chihuahua cheeses are made for the most part with pasteurized cow milk in very small and SMEs. It is quite common that these enterprises also make recombined cheeses and analogue cheeses. The consumption of unpasteurized Panela and Sierra cheeses may cause listeriosis.

The main challenges faced by very small and SMEs are: use of whey for products for human consumption, innovation in new products, adoption of cutting-edge technologies, and development of a culture of quality and safety.

The main opportunities are: recovery of whey proteins to increase the yield of cheese, market expansion through pasteurization and innovation in new products, assurance of food safety from production to consumers, and certification in Hazard Analysis and Critical Control Points (HACCP) by a recognized food safety entity.

Keywords: *Cheese Manufacturing Mexican Micro; Small and Medium-Sized Enterprises; Bovine Milk; Goat Milk; Soft Cheese; Brucellosis; Listeriosis; Challenges and Opportunities*

Introduction

Small and medium-sized enterprises (SMEs) are non-subsidary, independent firms that employ fewer than a given number of employees. This number varies across countries. The most frequent upper limit designating an SME is 250 employees, as in the European Union. Micro-enterprises have 1 - 9 employees, very small enterprises have 10 - 19 employees, small enterprises have 20 - 49 employees, and medium sized enterprises have 50 - 249 employees [1]. A major concern for Mexico is the very low productivity level of its SMEs. In fact, Mexico has the lowest labour productivity levels across all size classes within the OECD area [1], well below the average.

In 2016, Mexico produced 11,607 million liters of milk [2], equivalent, on the average, to 32.5 million kg per day. Approximately 98.8% was bovine milk and the remaining 1.2% was goat milk [2], equivalent, on the average, to approximately 390,000 kg per day. Other sources put the latter figure at 448,000 kg per day [3].

Production of milk is significantly less than consumption, and the country is one of the world's largest importers of Nonfat Dry Milk, with approximately 265,000 MT for 2016 [4]. This amount is equivalent to 8.2 million kg of skim milk per day. Mexico also imports significant amounts of whole milk powder, butterfat, sodium caseinate, aged cheeses for consumption and for processing, butter, dry whole milk powder, rennet casein, lactic casein and whey proteins.

Goat milk cheeses, frozen curd, and sweets

Goat milk is used to produce artisanal cheese (for the most part soft, fresh, cheese made in rural areas, although the production of French-style fresh cheese - using starter cultures - is increasing), milk candy spread ("cajeta"), a sweet similar to Argentina's dulce de leche, and other sweets. A large company is the leader in the production of cajeta and other sweets. Only one company, also large, is exporting goat milk frozen curd and making goat milk Feta cheese.

Fresh goat milk cheese manufactured by micro-enterprises in rural areas is made manually using raw milk. The cheese is made by enzymatic coagulation and is characterized by high pH (6.4 - 6.5) and high moisture content (54 - 56%), which makes it ideal for the proliferation of pathogenic microorganisms. Hence, this cheese is a public health hazard.

The consumption of this cheese may cause brucellosis (Malt fever or undulant fever), due to the presence of *Brucella melitensis* in the goat, which is then transmitted to the milk. In spite of numerous government programs to prevent the occurrence of this zoonotic disease, cases continue happening throughout the country: 1,174 cases in Michoacán between 2013 and September of 2016 and 1,082 in Sinaloa [5] in the same period, 60 cases in Baja California in 2016 [6] and, in the country as a whole, about 3,000 cases in 2015 [7].

Due to the high annual brucellosis incidence in humans, Mexico is considered an endemic brucellosis country. Although the disease may be transmitted to humans by different routes, the consumption of unpasteurized milk and cheese is of major concern.

It is estimated that micro-enterprises can produce between 30 and 300 kg of cheese per day, depending on the number of employees. Since the national production of goat milk cheese is of the order of 14,000 MT/year [8], the estimated number of micro-enterprises is of the order of 200 - 250.

The main challenge of these micro-enterprises is the adoption of pasteurization. Other challenges are:

- Adoption of conventional technologies.
- Development of a culture of food safety, through Good Hygienic Practices (GHP) and Good Manufacturing Practices (GMP).
- Development of a culture of quality.
- Insufficient training.
- Lack of financing.
- Inadequate communications infrastructure.
- Constrained managerial capabilities.
- Low labour productivity.

The main opportunities are:

- Use of whey for products for human consumption (Ricotta from 80% whey and 20% milk, Ricottone from whey, citric fruits-based refreshing beverages).
- Recovery of whey proteins by thermal denaturation to increase the yield of cheese.

- Market expansion through pasteurization and innovation in new products.
- Assurance of food safety and quality from production to consumers.

Bovine milk cheeses

Soft cheese remains the most popular kind of cheese in Mexico, such as Oaxaca, Panela and Sierra. Oaxaca cheese is similar to Low-Moisture Mozzarella Cheese, except that it is braided rather than formed into a block. It is made with thermophilic starter cultures and by direct acidification. Panela cheese is a soft, fresh cheese made by enzymatic coagulation and is characterized by high pH (6.4 - 6.5) and high moisture content (54 - 56%). Sierra cheese is also a fresh cheese made by enzymatic coagulation and it differs from Panela cheese in its lower moisture content (48 - 50%).

Due to their composition, both Panela cheese and Sierra cheese are ideal for the proliferation of pathogenic microorganisms. When made with raw milk, they may cause listeriosis, a very serious infective disease caused by *Listeria monocytogenes*, that affects mainly pregnant women, immunocompromised people and the elderly. Symptoms include vomiting and diarrhea, which may lead to meningitis and bacteremia. In a study of cheeses sold by street vendors and retail stores in Mexico City, Saltijeral, *et al.* [9] found that 15% of raw-milk Panela cheeses were contaminated by *Listeria monocytogenes*.

Other microorganisms of public health importance that may be present in milk or in cheese are pathogenic *Escherichia coli*, *Mycobacterium tuberculosis*, *Staphylococcus aureus*, and *Salmonella*, among others. Nevertheless, it must be pointed out that much raw milk is, in fact, free of pathogenic microorganisms [10].

Chihuahua (Mennonite) cheese is similar to Cheddar cheese but it has higher moisture content (42 - 43% vs. 39%) and is aged less extensively (two weeks vs. six months or more). It is popular mainly in northern Mexico. These cheeses are made by very small and SMEs for the most part with pasteurized bovine milk, using conventional technologies. Most of them have laboratories equipped with basic instrumentation (cryoscope and equipment for the measurement of titratable acidity, pH, moisture, and fat, and some also have equipment for the determination of protein).

It is quite common that these enterprises also make recombined cheeses (using a mixture of Nonfat Milk Powder, whole fluid milk, sodium caseinate and milkfat) and analogue cheeses (using partially hydrogenated vegetable fat as the main source of fat). Processed cheeses are made with natural cheeses and analogue processed cheeses with rennet casein and vegetable oil.

It is estimated that very small enterprises can produce up to 5 MT of cheese/day, and SMEs up to about 50 MT of cheese/day, depending on the number of employees and on the technologies used.

The main challenges faced by very small and SMEs are:

- Use of whey for products for human consumption (Ricotta from 80% whey and 20% milk, Ricottone from whey, citric fruits-based refreshing beverages).
- Innovation in new products.
- Adoption of cutting-edge technologies.
- Development of a culture of quality and safety.
- Lack of financing.
- Constrained managerial capabilities, with focus on short-term profits.
- Low labour productivity.

The main opportunities are:

- Recovery of whey proteins by thermal denaturation to increase the yield of cheese.
- Market expansion through pasteurization and innovation in new products.

- Assurance of food safety from production to consumers.
- Certification in Hazard Analysis and Critical Control Points (HACCP) by a recognized food safety entity.

Bibliography

1. OECD. "Mexico Policy Brief. Economy. Raising Productivity in Small Traditional Enterprises" (2017).
2. CANILEC (National Chamber of the Dairy Industry). Estadísticas. Producción de leche. Mexico City (2017).
3. Flores-Castro R. "Control de la brucelosis caprina en Mexico". 23a Reunión Anual del CONASA. Salud, Inocuidad y Producción Animal, Compromiso de Todos. Zacatecas, Mexico (2015).
4. Hernández G and A Hernández. "Mexico. Dairy and Products Semiannual. Mexico's Dairy Products to Increase in MY2016". Global Agricultural Information Network. USDA Foreign Agricultural Service (2016).
5. Martínez-Martiñón A. "Desde 2013, Michoacán registra el mayor número de casos por Brucelosis en México" (2016).
6. Cruz-Aguirre J. "En 2015 aumentaron casos de brucelosis en el estado" (2016).
7. Anonymous. "Panorama epidemiológico de la brucelosis en Mexico 2009 - 2016". Boletín Epidemiológico. Sistema Nacional de Vigilancia Epidemiológica. Sistema Único de Información 33.33 (2016).
8. Ducoing-Watty AE. "Producción de leche de cabra: situación y perspectivas" (2011).
9. Saltijeral JA, *et al.* "Presence of Listeria in Mexican Cheeses". *Journal of Food Safety* 19.4 (1999): 241-247.
10. Fox PF, *et al.* "Pathogens and Food-Poisoning Bacteria in Cheese". Chapter 20 in *Fundamentals of Cheese Science*. Aspen Publishers, Inc. Gaithersburg, Maryland, USA (2000).

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