

Hazard Analysis and Critical Control Points (HACCP) Plan for Parmesan Cheese

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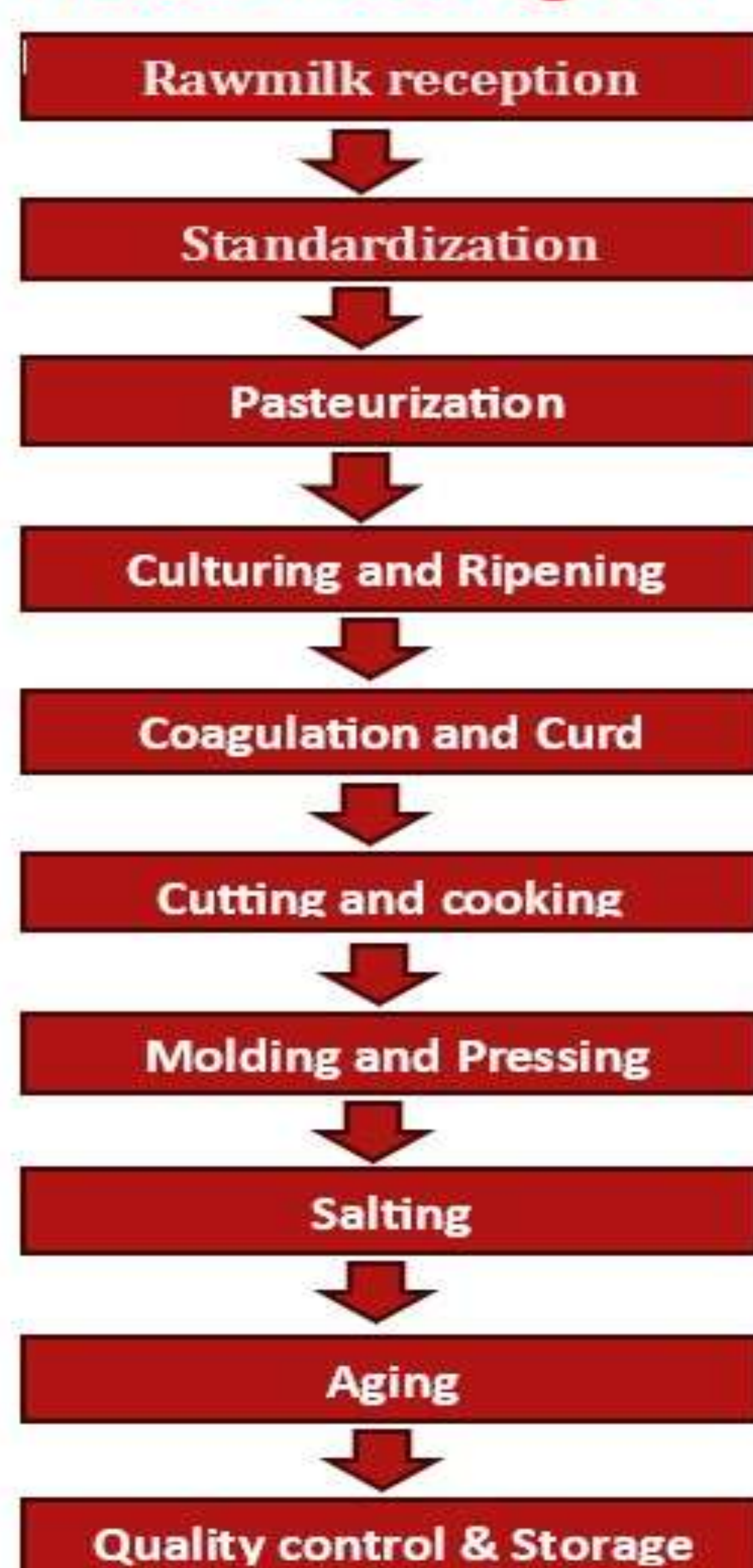
ABSTRACT

This study delineates the application of the Hazard Analysis and Critical Control Points (HACCP) approach to Parmesan cheese production, a distinguished Italian dairy product known for its firm texture and nuanced flavor profile. Originating from the Parma and Reggio Emilia regions, Parmesan cheese production is meticulously guided by the principles of Protected Designation of Origin (PDO) to ensure authenticity and adherence to time-honored techniques. Incorporating HACCP, the study identifies critical control points that address potential biological, chemical, and physical hazards, thus ensuring a methodical risk mitigation process. Aligning with Good Manufacturing Practices (GMP), the protocol emphasizes preventive measures, stringent monitoring, and swift corrective actions. Historical data on recalls provide a foundation for robust recall strategies, enhancing the safety and quality assurance mechanisms. The implementation of this tailored HACCP framework is instrumental in maintaining the legacy of Parmesan cheese while ensuring safety, quality, and compliance with regulatory standards, ultimately reinforcing consumer confidence in this iconic product.

INTRODUCTION

Parmesan cheese, or Parmigiano Reggiano, is a renowned Italian cheese with a hard texture and a sharp, rich taste. It's made from cow's milk in the Parma and Reggio Emilia regions and aged for at least 12 months. As a Protected Designation of Origin (PDO) product, it follows strict production methods. Its aging process results in a low moisture content, which contributes to a longer shelf life and a distinctive granular texture. Widely used in Italian cooking, it is known for its ability to elevate the flavor of a wide array of dishes. Implementing Hazard Analysis and Critical Control Points (HACCP) is critical in Parmesan cheese production to identify and minimize potential biological, chemical, and physical hazards. This systematic preventive approach ensures the safety and quality of the cheese, preserving its esteemed reputation among consumers.

Process flow Diagram



DETERMINATION OF CCPs

Critical Control Points	Potential Hazards	Prevention Measures
Receiving Milk	Bacteria (Salmonella, E. coli, Listeria), Antibiotic residues, Metal/Glass	Inspect and test milk, keep milk chilled at 4°C (39.2°F)
Pasteurization	Thermophilic bacteria, Chemical changes, Equipment contaminants	Pasteurize at 72°C (161.6°F) for 15 seconds, regular equipment maintenance
Culturing and Ripening	Pathogens (Listeria, Staphylococcus aureus), Incorrect fermentation	Maintain ripening room at 30°C, pH between 6.0 - 6.4, strict hygiene
Coagulation	Harmful bacteria due to wrong pH/temp (Clostridium botulinum, E. coli), Residues	Monitor for pH 5.3 at 32-35°C, ensure proper equipment sanitation
Cutting and Cooking	Pathogens (E. coli, Salmonella, Listeria), Cleaning chemicals, Physical hazards	Cook curds at 55-58°C, thorough cleaning and foreign object controls
Salting	Bacterial survival (E. coli, Listeria), Contamination, Physical impurities	Ensure even salt coverage, store salt properly, screen for physical impurities
Aging	Bacterial/mold growth (Listeria, molds), Toxins (biogenic amines), Wood shavings	Age at 10-16°C with 80-85% humidity, inspect and clean shelves regularly

Table 1: Hazard analysis of each step of manufacturing process of Parmesan Cheese



Fig 1. Manufacturing of Parmesan Cheese in industries

CCP & Monitoring	Corrective Actions	Verification
Milk Temperature and Antibiotic Tests CCP 1	If milk temp is above 4°C, reject the milk. If antibiotics are detected, reject the milk.	Regular calibration of thermometers, review of milk test records.
Pasteurization Temperature and Time CCP 2	If pasteurization does not reach 72°C for 15 seconds, reprocess or discard the milk.	Daily checks of pasteurization logs, recalibrate equipment.
Ripening Temperature and pH (30°C, pH 5.3-5.4) CCP 3	If temperature or pH falls outside specified ranges, adjust and reassess the batch for safety.	Regular reviews of ripening logs, recalibrate pH meters and thermometers.
Coagulation pH and Temperature (32-35°C, pH 5.3) CCP 4	If pH or temperature is incorrect, adjust rennet or temperature. Reprocess or discard the batch if not corrected.	Periodic calibration of pH meters and thermometers, review of coagulation logs.
Curds Cooking Temperature (55-58°C) CCP 5	Adjust cooking temperature if outside 55-58°C. Re-evaluate the batch for safety if parameters are not met.	Continuous monitoring and review of cooking temperature logs.
Salt Concentration in Brining CCP 6	If salt concentration is incorrect, adjust and resalt. Downgrade or discard the batch if issue persists.	Check calibration of salometers, review of salt concentration logs.
Aging Temperature and Humidity (10-16°C, 80-85% humidity) CCP 7	Adjust climate controls if temperature or humidity falls outside the range. Test cheese for microbial growth if needed.	Regular checks and recalibration of hygrometers and thermometers, review of aging logs.

Table 2: HACCP Plan (Critical limit, monitoring Control, Corrective Actions and verification)

RECALLS

Company	Recall Time	Recall cause	Affects	Resource
Bella Formaggio Ltd.	May, 2019	Foreign objects – metal fragments	10,000 units recalled, no injuries reported	https://www.fda.gov/safety/recalls/bella-formaggio-metal-fragments
Arthur Schuman Inc.	July, 2015	Contains undeclared allergen.	No illnesses reported to date.	https://www.foxnews.com/health/nj-company-recalls-30200-pounds-of-parmesan-cheese
Reggio Dairy Inc.	July,	E.Coli	Occurred in 5 states, 30 people affected, 10 hospitalized	https://www.cdc.gov/ecoli/2021/reggio-dairy-parmesan-outbreak.html
ParmaCheeseCo.	March, 2020	Mislabeling – undeclared nuts	Nationwide, 45 people affected, 2 hospitalized	https://www.foodsafetynews.com/parma-cheese-recall/

MONITORING POINTS

Receiving and Storage of Milk: Strict temperature controls and quality checks.

Curd Processing: pH and temperature monitoring to ensure proper bacterial culture development.

Salting and Aging: Salt concentration checks and aging environment controls.

Final Quality Control: Sensory analysis and packaging integrity assessment

RECORD KEEPING AND DOCUMENTATION

Maintaining detailed records of HACCP compliance, including temperature logs, batch codes, and cleaning schedules, is essential for traceability and food safety verification.

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