



Cornell University
Dairy Foods Extension
Stocking Hall, Ithaca NY

Department:

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Subject: Raw Milk Cheddar

Issued by:

Approved by:

Plant Number:

1.0 PURPOSE

To establish fixed procedures to be followed during the cheese making process for raw milk cheddar in at _____. A strict record of all proceedings shall be made so that food safety/quality issues might be addressed.

2.0 SCOPE

This SOP applies to the production of raw milk cheese produced at _____ and all employees that are involved in the production of this cheese.

3.0 SAFETY & ENVIRONMENTAL CONSIDERATIONS

When working around hot water or chemical cleaners, always use care and follow instructions for use.

4.0 FREQUENCY

This SOP applies anytime raw milk or thermalized cheese is produced.

5.0 RESPONSIBILITY

- **TASK**
_____ Staff, anyone using plant for cheese production
- **VERIFICATION**
_____ Management
- **PAPERWORK REVIEW**
As needed to address quality or safety concerns, by appropriate managers/regulatory officials

6.0 SUPPLIES/EQUIPMENT

6.1 Supplies

- 6.1.1 Milk
- 6.1.2 Appropriate cultures, rennet, calcium chloride (when/if needed), salt

6.2 Equipment

- 6.2.1 Jacketed cheese vat with paddles (automated)
- 6.2.2 Milling machine
- 6.2.3 Cheese vat strainer
- 6.2.4 pH meter

- 6.2.5 Calibrated thermometer(s)
- 6.2.6 Cheese press
- 6.2.7 Molds (_____ molds manufactured by _____)
- 6.2.8 Cheese knives (_____ knives manufactured by _____)
- 6.2.9 Vacuum bags (_____ bags manufactured by _____)

6.0 PROCEDURE **NOTE***this procedure is for raw milk cheddar cheese. Cultures used, aging, and certain steps for other styles of cheese will differ, depending upon the cheese type.**

6.1 Cheese making preparation

- A. In a clean and properly sanitized vat, add raw milk volume. Take initial pH reading and record it.
- B. Warm milk to 90.0°F while gently mixing.

6.2 Fermentation

- A. Record lot numbers of cultures and calcium chloride on the make sheet.
- B. Add culture(s) at the appropriate amounts. See make sheet for standards as mathematical calculations are required based on milk volume for all ingredients. Cultures are added at a rate of _____ gr/ _____ gallons of milk and _____ gr/ _____ gallons.
- C. Stir vat for 5-10 minutes to ensure adequate and complete distribution of culture. Maintain heat on vat +/- 1°F during fermentation stage. Fermentation stage takes approximately 45-60 minutes.
- D. pH measurements must be taken at the intervals specified in the make sheet and recorded to ensure the culture is functioning and there is an increase in acidity. Record this reading on the make sheet. Add calcium chloride, when/if needed. Calcium chloride is added at a rate of _____ ml/ _____ gallons of milk.

6.3 Coagulation

- A. Record lot number of rennet/coagulant on the make sheet.
- B. Upon attaining a pH of 6.57-6.61, add rennet (or coagulant of choice) to milk and stir for 2-4 minutes. Maintain temperature at 89-90°F (+/-1°F) to ensure rennet functions at the same level between production lots (enzymatic reactions are temperature sensitive). Rennet is added at a rate of _____ ml/ _____ gallons of milk. Rennet set takes 30-45 minutes with properly function enzyme. Determining when the curd is ready to cut must be determined and takes expertise and experience.

6.4 Cutting

- A. Using a clean and sanitized cheese knife cut the curd first with the horizontal cheese knife the length of the vat.

B. Using a clean and sanitized cheese knife cut the curd next with the vertical cheese knife the length of the vat.

C. Finally, using the vertical knife cut the curd across the vat. Ensure that all cheese has been cut and a uniform cube size throughout has been obtained. Take a sample and measure pH and record on make sheet.

6.5 Healing

A. Allow the curd to heal after cutting for approximately 5 minutes. This is done by not agitating or heating.

B. Allow the curd to heal for another 10 minutes, but at this time with very gentle stirring (lowest stir setting on the vat) to keep the curd from coagulating back together. Take a pH reading and record.

6.6 Cooking

A. Increase temperature gradually from the current temperature (should be 88-90°F range) to 94°F over 15 minutes with very gentle stirring.

B. Increase temperature gradually from 94°F to 102°F over 15 minutes, gradually increasing the rate of stirring during this time. Cheese should continue to be cooked at 102°F until a pH of 6.35.

6.7 Draining

A. Place a clean and sanitized drain strainer in vat to keep cheese in the vat. Open the drain and drain off whey. Pull cheese curd up against vat sides to help facilitate whey draining.

B. Dispose of whey in an approved manner.

C. Allow cheese to drain in a mat for 15 minutes. This also allows the curd mat to knit back together.

D. Cut mat into manageable pieces (5-10 lbs) for the cheddaring process. Take a pH reading and record.

6.8 Cheddaring

A. Cheddaring is a term that means nothing more than flipping cheese curd mats to facilitate whey draining. The manageable curd mats as the cheddaring process goes on are stacked so that the added weight/pressure helps push out more whey. The pieces are cheddared every 15 minutes for as many times as it takes for the pH to drop to the 5.35-5.40 range.

6.9 Milling

A. After reaching a pH of 5.35-5.40, the cheddared pieces are milled using a clean and sanitary milling machine. CAUTION: Milling machine has moving parts and spinning blades.

B. Cheese tested for coliform and moisture.

C. Samples retained for regulatory authority. Samples must be labeled with an appropriate label with accurate measurements and information.

6.10 Salting

A. Record lot number and manufacturer of salt on the make sheet.

B. Salt concentration must be calculated based on the volume of milk that you started with. Salt is added at a rate of _____ lbs/_____ lbs of curd. Salt should be split into several applications to ensure proper distribution. For vats <100 gallons, 2 applications can be done, for >100 gallons, 4 applications should be made.

C. Add first salt application (~ ¼ of salt total) and mix thoroughly. Wait 5 minutes.

D. Add second salt application (~ ¼ of salt total) and mix thoroughly. Wait 5 minutes.

E. Add third salt application (~ ¼ of salt total) and mix thoroughly. Wait 5 minutes.

F. Add fourth salt application (~ ¼ of salt total) and mix thoroughly. Wait 5 minutes.

G. Take pH reading and record it on the make sheet. Molding should occur when the pH is at approximately 5.25.

6.11 Molding

A. Thoroughly wash and sanitize hands. Place cheese into molds as required being careful not to contaminate the cheese in the process. Molds should be clean and sanitary as well as any equipment/utensils being used for this process.

B. On the make sheet in NOTES, RECORD how much cheese was made (IE: 5-20 lb blocks, 30-2 lb wheels, 6-5 lb bags of curd). This becomes important for traceability and recall situations, if ever required.

6.12 Pressing

A. Place molds into the press with their tops up (insert is considered the top).

B. Initial pressure on the cheese should be set at _____ lbs.

C. After 1 hour, increase the pressure to _____ lbs.

D. After 1 more hour, increase the pressure to _____ lbs. Leave the cheese at room temperature in the press overnight.

6.13 Aging

A. Take cheese out of molds and place in aging room. Take pH reading and record it.

B. Age for approximately 2-3 days to dry.

B. Place cheese in vacuum bags and secure vacuum at the following adjustment points for the different sizes:

5# bag cheese:	0.65-0.7 psi vacuum	Setting of 2,1,9 (and take out top plate)
¼ # bag:	0.5psi vacuum	Setting of 1.5,1,9
2# wheels:	Full vacuum	Setting of 6.5,1,9
5 and 20# blocks of curd:	Full vacuum	Setting of 10,1,9 (and take out top plate)

C. Age for the appropriate amount of time, flipping the cheese for even aging every week.

D. Sample the cheese monthly after month three to ensure flavor profile/development is occurring.

E. Take pH reading at every sampling and record it. This will help to make a consistent product.

7.0 ATTACHMENT/DOCUMENTATION

Cheese Make Sheet, Pasteurization Records, Lot Numbers for any products used during processing, Troubleshooting Guide.

6.0 SIGNATURES AND APPROVALS

Role	Name and Title	Signature	Date