Let's Make Cheese

http://www.deejayssmokepit.net
http://www.deejayssmokepitforums.net

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I. Introduction

This eBook is all about making cheeses for the home cheese maker. The idea for creating the eBook came from the wonderful members of my forum at *http://www.deejaysdmokepitforums.net*. They are more a family to me than my own flesh and blood at times, and I've come to love them all dearly.

This eBook is dedicated to one of my most talented and arduous members. He keeps me busy trying to come up with new ideas or dig up some very old ones to keep him challenged. I dedicate this eBook to Dom (aka SlowPokeScotty).

I've been making cheeses at home as one of my many hobbies off and on since 1974 and a lot has changed since then. Would be cheese makers now have access to all kinds of Starter cultures that where once only available to commercial cheese producers so cheeses are no longer limited to basic Junket® rennet cheeses using either yogurt or buttermilk for home grown starter cultures.

With suppliers like The Dairy Connection and Glengarry Cheese making these cultures available to the hobbyist making authentic old world cheeses is possible for all hobbyists. All that is needed is a few simple tools which can be made at home and the time and patience to achieve excellence. As they say the world is your oyster.

So … Let's make cheese!

II. A Few Cheese Basics

Everyone has to know a little basic theory before they can get started in almost any endeavor so that's what this section will be about. There are some very important facts you will need to know so don't skip over this section!

Definitions

Here is the definition of cheese according to Wikipedia

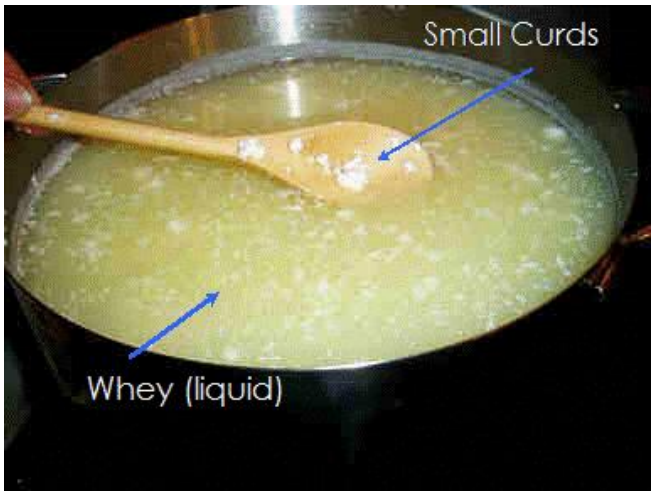
"**Cheese** is a solid food made from the milk of cows, goats, sheep, and other mammals. Cheese is made by curdling milk using a combination of rennet (or rennet substitutes) and acidification. Bacteria acidify the milk and play a role in defining the texture and flavor of most cheeses. Some cheeses also feature molds, either on the outer rind or throughout."

Milk - Cheeses can also be made from the milk of cows, goats, buffalo, sheep, horses and even reindeer but is most commonly made from cows, goats and buffalos milk in the US. Milk should be a fresh as possible when making cheese. It can be made from fresh raw milk or commercial pasteurized milk which is best when calcium chloride is added.

There are some types of milk that will not coagulate with rennet. My research indicates that you should avoid milk from humans and those animals most closely related to humans – such as apes or gorillas – they will not work.

NOTE: *Ultra High Temperature (UHT) pasteurized milk or cream will not make cheese. I have found out recently that the label does not have to say the milk is UHT pasteurized but you can check the expiration dates. Normally pasteurized milk will expire within a few days. UHT will last for several weeks. Some say indefinitely. UHT pasteurized milk may also be labeled as ESL – extended shelf life. Avoid it when making cheese.*

Curds - are obtained by coagulating milk with rennet or an acidic substance then draining off the liquid. Curds start out as a soft gel like substance and after time become more firm and cheese like. Curds are often called green cheese.



The curds can be enjoyed as is, often referred to as squeaky cheese, breaded and fried or formed in various shapes and pressed to make cheese.

Whey - is the liquid remaining after milk has been curdled and solidified. Whey can be used to produce ricotta, Gjetost and other whey type cheeses and many other products. I can also be added to breads and pastry recipes in place of water, feed to animals or used in your garden.

Acidification - is traditionally considered any chemical compound that, when dissolved in water, gives a solution with a pH less than 7.0. Don't worry if you failed Chemistry it's not really needed here but can be helpful if you really want to understand the process. Simply put acidification is just souring the milk to prepare it for making cheese. This is usually done by adding lactic acid bacteria (LAB) or starter culture. This is sometimes referred to as inoculating the milk.

Coagulation - the process of changing a liquid, (in this case milk), to a thickened curd. This is also called curdling, which is what makes the liquid milk become a solid - cheese. Milk can be coagulated using one of two methods;

Acid coagulation – using acidic substances such as lemon juice or vinegar or commercially available bacterial cultures which turns the lactose (milk sugar) into lactic acid.

Or

Rennet coagulation – Using animal or vegetable based rennet.

Note: When curdling the milk is deliberately soured to form solids (curds), so that the liquid (whey) can be removed and the solids to form loaves or cheese.

Rennet - There are animal and vegetable rennet available. They come in liquid, powder and tablet form.

Animal rennet is a natural complex of enzymes produced in the stomach of any mammal to digest the mother's milk. Rennet contains a proteolytic enzyme (protease) that coagulates the milk, causing it to separate into solids (curds) and liquid (whey). The active enzyme in rennet is called *rennin* or *chymosin* but there are also other important enzymes in it such as pepsin or lipase.

Vegetable rennet is made from the thistle family of plants. They are often used for produce kosher and vegetarian cheeses.

Note: Many of the basic cheeses can be made with Junket® Rennet which can be found in the pudding section of most grocery stores! For simplicity I will start there.

Clean Break - Once the milk has been inoculated and rennet added it will coagulate or thicken into something looking very much like plain yogurt (which by the way is considered a cheese).

A clean break is when you can insert a clean bent finger into the coagulated milk and lift your finger up and out cleanly. It will at first look like a pudding trying to stick to your finger then it will just fall away cleanly leaving a small puddle of whey where your finger was. In the picture I used a knife to make it easier for you to see.

Cultures – Cheese cultures are used to acidify the milk. There are several varieties of cultures which react differently with milk to adjust the pH.

There are two basic categories of cultures:

Mesophilic Cultures - These are used for most soft cheeses and many hard cheeses that are not heated over 102°F (39°C). The word 'meso' means middle and these cultures are used for cheeses where the recipe requires temperatures between 68 and 102°F (20 and 39°C).

And

Thermophilic Cultures – These are 'heat loving' and these will do best for the higher temperature cheeses that require heating to 104 -128°F (40 - 54°C).

Cheese cultures can be as simple as a using spoon full of plain yogurt or butter milk, or be so complicated as to require special laboratories to grow and package depending on the types of cheeses and milk you are using. We will get into this in more detail later.

Calcium Chloride – This is used to improve curd size and texture when using store bought milk.

Citric Acid - Used to increase acidity when necessary for certain types of cheeses.

Tartaric Acid - Is used with light cream to make fresh mascarpone desert cheeses.

Flaked Cheese Salt – Is a specialty grade, additive free pure salt for seasoning cheese, canning, hot sauces and mustards. It enhances the flavor and inhibits spoilage.

Cheese Salt – The best salts for making cheese are sea salt, kosher salt and pickling salt. Do not use an iodized salt as it will affect the ripening of the cheese.

Lipase – is an enzyme used to enhance the flavor of Italian and Spanish specialty type cheeses. It comes in several varieties such as kid, calf and lamb and combinations of each to produce the traditional "Old World" flavors of European cheeses. This enzyme is a "must" making some cheeses like Feta, Romano, Pecorino, Manchego and Parmesan.

Molds – There are a few types of molds used in cheese making. White, and green/blue molds.

Penicillum Candidum - the white mold. These are freeze-dried mold spores for use in surface ripened cheeses such as Brie, Camembert, Colommiers, Saint Maure, etc. They produce a creamy white appearance and velvety texture. It comes in two varieties:

VS – which is mild flavored for use with cows milk cheeses.
Neige – which is stronger flavored – for use with goats milk cheeses.

Penicillum Roqueforti - a very fast growing blue-green mold culture. Produces an intense dark blue-green marbled interior with a piquant aroma and creamy texture. Use for blue mold cheese such as Blue, Roquefort and Gorgonzola.

Brevibacterium linens - Used for the production of an orange/yellow surface color formation on cheese. Produces a characteristic "sulphur" aroma associated with washed rind and smear cheeses like muenster, brick and limburger. There are two types:

LR - *Brevibacterium linens* standard
SR3 - Less aromatic than LR

Geotrichum candidum – This is used in conjunction with other molds. Grows rapidly on cheese surface first and aids in the formation of Penicillium candidum and Brevibacterium linens. It will produce a thick, velvety surface to really give your other molds a foothold. There are there types:

GEO 17 - Mold like appearance - Very mild flavor and aroma
GEO 15 - Yeast like appearance - Mild flavor and aroma
GEO 13 - Mold like appearance - Intermediate flavor and aroma

Moulds – These are the shape forms used to press cheeses. They are often referred to as cheese hoops. The usage of the words mold and mould have been debated for years. Which to use can also depend on what country you live in. It can be confusing so for the sake of this eBook I will use mold for the white and green/blue cheese molds and mould for the cheese forms or hoops.

Cheese Families

Professor Arthur R. Hill of the Dept. of Food Science, at the University of Guelph, Canada has a great table illustrating the relationships of cheese and their categories and has graciously granted me permission to use it.

Cheeses are organized into families or categories by the way they are made. There are seven cheese families and this can help you decide what types of cheese you like and whether or not you might want to attempt this style of cheese.

Cheese Families	
Information provided by: Professor Arthur R. Hill Dept. of Food Science, University of Guelph, Canada Used with Permission	
http://www.foodsci.uoguelph.ca/dairyedu/cheese2.html	
The objectives of cheese making are: (1) To obtain the optimum cheese composition with respect to moisture, acidity (pH), fat, protein and minerals (especially calcium); (2) Establish the correct structure of the cheese at the microscopic level; and (3) Ripen to perfection. Objectives (1) and (2) are achieved by varying initial make procedures and it is then possible to achieve objective (3). Most of these variations in initial make procedures are different means to control the rate and extent of acid development, and the rate and extent of moisture release.	
Family 1. Acid-coagulated Fresh Cheese	
Varieties	Cottage, Quark and Cream
Coagulation	The distinguishing characteristic of these varieties is that coagulation is achieved by acidification to pH 4.6 - 4.8, with little or no coagulating enzyme. Acidification is normally by lactic acid producing cultures. Most other American and European cheese varieties also use lactic acid producing cultures, but gelation is induced by a coagulating enzyme at pH 6.5 - 6.7, before much acid development has taken place.
pH Control	After cutting at pH 4.6 - 4.8, the curd is cooked to 52 C which is sufficient to inactivate the culture and prevent further acid development. Acidity is also reduced by washing the curd before salting.

Curd moisture (%)	Curd moisture is reduced by syneresis during cooking but remains high, 60 - 70%, in the finished cheese.
Curing	Fresh cheese as the name implies is consumed fresh and has a shelf life of only 2 - 3 weeks.

Family 2. Rennet-coagulated Fresh Cheese	
Varieties	Queso Blanco, Queso Fresco, Italian fresh cheese, Halloumi
Coagulation	The distinguishing characteristic of rennet coagulated fresh cheese is that little or no culture is used. Coagulation is, therefore, entirely by rennet at the natural pH of milk.
pH Control	The pH is determined by the amount of culture. If no culture is used, the pH remains in the range of 6.5-6.7. In some Queso Blanco varieties a small amount of culture is used to reduce the pH to about 5.8 which reduces the growth of both spoilage (increases shelf life) and pathogenic (increases food safety) microorganisms. Further acidification is inhibited by cooling and salting. Too much acidification below pH<5.8 will produce a meltable cheese which is unsuitable for frying.
Curd moisture (%)	Curd moisture may be reduced by syneresis during cooking and limited acidification, but is still 50 - 70% in the finished cheese. Some varieties exhibit syneresis after packaging.
Curing	Consumed fresh and has a shelf life of only 2 - 4 weeks.

Family 3. Heat-Acid Precipitated Cheese	
Varieties	Ricotta (Italy), Channa and Paneer (India), some varieties of Latin American white cheese.
Coagulation	Coagulation is accomplished by direct acidification of heated milk. High heat treatment of milk (temperatures greater than 75C) causes denaturation of the whey proteins. Subsequent acidification of the hot milk coagulates both casein and whey proteins, so that most of the milk protein is recovered in the cheese.
pH Control	The final acidity (pH) is determined by the amount of acid added. Final pH is normally in the range of 5.3 - 5.8. Any organic acid can be used, but lactic and citric acids are most common.

Curd moisture (%)	Moisture can be reduced by holding the curd in the hot curd-whey mixture after coagulation, and by draining and pressing procedures. Moisture is generally high (55 - 80%) due to the high water holding capacity of whey proteins.
Curing	Heat-acid precipitated varieties are normally consumed fresh. An exception is Mizithra, a type of ricotta cheese which is cured, dried, and consumed as a grating cheese. It is also possible in some cases to hot pack heat-acid varieties to obtain extended shelf life. High concentrations of whey proteins decrease cheese melt ability and account for the excellent cooking properties of heat-acid precipitated cheese.

Family 4. Soft-Ripened Cheese	
Varieties	Feta, Camembert, Brie, Blue
Coagulation	Coagulation is primarily rennet (enzymatic) with three important differences relative to cooked and pressed varieties (Families 5-7). (1) The amount of lactic acid bacteria inoculum is large and the ripening period before renneting is extended. The result is that acidification has considerable influence on the development of curd structure during setting and demineralization of the curd is decreased. (2) Cutting is delayed (i.e., setting time increased) to further encourage acidification and demineralization before cutting. (3) Cutting is accomplished with large knives or just broken up with paddles to minimize moisture and fines losses before filling the forms.
pH Control	The distinguishing feature of these cheeses is that the curd is placed in the forms while still sweet and let stand in a warm room for several hours. Acidification (i.e. conversion of lactose to lactic acid) continues until the accumulation of lactic acid inhibits culture growth. Acid development is also influenced by the time and amount of salting. The pH is normally about 4.3 - 4.6 on the day following manufacture and in the case of Feta remains low during curing, The pH of mould ripened varieties increases during curing (i.e., acidity decreases), especially Camembert and Brie.
Curd moisture (%)	Syneresis is induced by acid development after forming and by brine salting. Moisture content is typically 45 - 60%.
Curing	2 - 8 weeks.

Family 5. Semi-hard Washed Cheese	
Varieties	This is the largest and most diverse group of cheese including Gouda, Edam, Colby, Brick, Montasio, Oka, Muenster and many others.
Coagulation	See family 4

pH Control	The distinguishing feature of these cheeses is the practice of washing to remove lactose. Part or all of the whey is removed and replaced with water to leach lactose from the curd. The objective is to limit the amount of lactose to a level which permits sufficient lactic acid development to produce a minimum pH of 5.0 - 5.2, but not enough to ferment and produce cheese pH less than 5.0.
Curd moisture (%)	The amount of syneresis is controlled mainly by the temperature and time of cooking and by the temperature of the wash water. Higher temperatures during cooking or washing cause the curd to contract and expel moisture. Also, important are the rate of acid development and salting treatments. Washed curd cheeses typically have moisture contents of 40 - 50%. With few exceptions, such as, part skim Mozzarella, production of a rennet coagulated cheese with a moisture content of 40% or greater requires a washing treatment to remove the substrate for lactic acid fermentation, i.e., lactose.
Curing	2 weeks - 9 months.

Family 6. Hard Cheese: Low temperature	
Varieties	Cheddar types and Pasta Filata types. Cheddar and Pasta Filata manufacture are similar in the early stages. Pasta Filata varieties are distinct in that they are worked and stretched in hot water and brine salted. Cheddar types are salted before hooping and pressing.
Coagulation	Coagulation is primarily rennet (enzymatic) with three important differences relative to cooked and pressed varieties (Families 5-7). (1) The amount of lactic acid bacteria inoculum is large and the ripening period before renneting is extended. The result is that acidification has considerable influence on the development of curd structure during setting and demineralization of the curd is decreased. (2) Cutting is delayed (i.e., setting time increased) to further encourage acidification and demineralization before cutting. (3) Cutting is accomplished with large knives or just broken up with paddles to minimize moisture and fines losses before filling the forms.
pH Control	The distinguishing feature of these cheeses is that acid development is mainly controlled by the amount of syneresis. As with semi-hard cheese, the objective is to obtain a minimum pH of 5.0 - 5.2 within 1 - 3 days after manufacture. Lactose content is substantially reduced by fermentation with associated moisture loss during cheddaring and vat salting.
Curd moisture (%)	Moisture is controlled by cooking temperature and time, stirring out after draining, cheddaring, amount of culture, and salting treatments. Typical moisture content is 35 - 39% for Cheddar types and up to 52% for Pasta Filata types.
Curing	1 - 36 months.

Family 7. Hard Cheese: High Temperature	
Varieties	Romano, Parmesan, Swiss
Coagulation	Coagulation is primarily rennet (enzymatic) with three important differences relative to cooked and pressed varieties (Families 5-7). (1) The amount of lactic acid bacteria inoculum is large and the ripening period before renneting is extended. The result is that acidification has considerable influence on the development of curd structure during setting and demineralization of the curd is decreased. (2) Cutting is delayed (i.e., setting time increased) to further encourage acidification and demineralization before cutting. (3) Cutting is accomplished with large knives or just broken up with paddles to minimize moisture and fines losses before filling the forms.
pH Control	Type of culture, time-temperature profile during pressing until cooling, lactose removed by syneresis. Little acid development before draining.
Curd moisture (%)	Rapid syneresis induced by high renneting temperature and high cooking temperature.
Curing	1 - 36 months

Another good classification table to identify cheeses is listed below.

Classification of Cheese		
1. Moisture Content	2. Fat Content	
Curing Characteristics		
1. Cured or ripened cheese	2. Mold cured or mold ripened cheese	
Terms for Classifications of Cheese		
1st Term designation	2nd Term designation	3rd Term designation
Extra hard	Skim	1. Cured or ripened
Hard	Low fat	2. Mould cured or ripened
Semi-hard	Medium fat	3. Uncured or un-ripened
Semi-soft	Full fat	
Soft	High fat	
Moisture % fat-free basis	Fat % total solids basis	Principal Curing Characteristics
less than 41%	less than 10 %	a. Mainly surface b. Mainly interior
49 to 56 %	10 to 25 %	a. Mainly surface b. Mainly interior
54 to 63 %	25 to 45 %	
61 to 69 %	45 to 60 %	No curing; must be made from pasteurized milk
More than 67 %	more than 60 %	

Factors That Determine What Type of Cheese You Make

Let's say you are planning on using 1 gallon of milk - what kind of cheese you make is determined by the following factors:

1.) The type of milk you use – (cows, goats, buffalo, sheep, etc. milk)
2.) How long the milk is left to sour
3.) The use of rennet
4.) Temperature
    a. the temperature of the milk when you add the rennet
    b. the cooking temperature of the milk - the higher the temperature the finer the curds, the finer the curds the harder it is to drain the whey from the curds.
5.) The length of time it is cooked
6.) The size of the curds when they are cut
7.) The firmness of the cheese when the curds are pressed
8.) The ripening of the cheese
    a. ripening or aging time,
    b. the ripening temperature
    c. the humidity levels while the cheese is ripening

Equipment Needed to Make Cheese

Almost of my beginning recipes are designed using one gallon of milk at a time. Most of the equipment you already have will be big enough for 1 or 2 gallons of milk. There are a few types of cheese that will require larger quantities because of curing problems that cannot be avoided using smaller quantities.

For the most basic cheeses you will need the following:

A good Thermometer which reads at least from 0 to 250°F
Cheese cloth, Butter Muslin or cotton tea towels - can be washed and reused.
A stainless steel or plastic colander or drain basket.
A thick bottomed stainless steel pot large enough to hold 1 or 2 gallons of milk.
Measuring devices such as, spoons, cups etc.
Rennet – use according to the manufactures instructions per gallon of milk.
Sanitizer – there are many on the market.

Note: Do not use aluminum pots! The acids developed during the cheese making process will dissolve aluminum and be absorbed into your cheese!

Enamel pots may be used ONLY if there are not chips or cracks in the pot. It is best to stick with non reactive pots like Stainless Steel.

Other equipment for making more advanced cheeses

A pot large enough to put a second pot in to make a 1 gallon double boiler
A wire cooking rack to set the inner pot so it doesn't touch the bottom
A long knife or spatula - long enough to reach the bottom of the pot
Coloring tablets or ammatto
Bacterial cultures
Cheese Wax or a vacuum sealer
Cheese moulds - for holding the curds for pressing
A Cheese press or some way to add weight to the moulds to press the cheese

Note: All tools and equipment need to be sterilized/sanitized before use. Do not boil thermometers! Wash careful and submerge in sanitizer as directed. Keep a small bucket of sanitizer handy when making cheese to sanitize tools between each use.

III. Making a Cheese Press

Cheese presses may be purchased from many of the suppliers listed in the last section of this eBook for around $100 or you can make one yourself with a little thought and some stuff you may already have around the house for about $15.

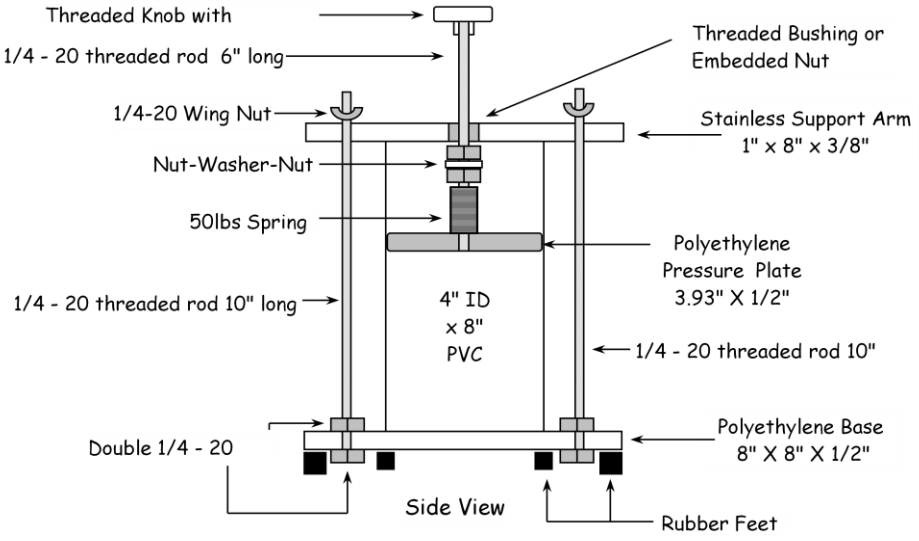
If you have access to cutting tools a cheese press can be made by making some kind of container with a follower plate to add pressure to the cheese to help expel whey. They can be round or square or any shape you want. They may be made of exterior grade plywood, plastics or PVC. The choice is yours! I choose PVC plastics and stainless steel because they last longer and absorb less moisture.

When planning your cheese press, start small. You'll more than likely be making small batches of cheese using one or two gallons of milk which should only yield about one pound of cheese. So unless you have your own cow, goat or buffalo a small 4 inch PVC cheese press should be plenty big enough.

Here are a few designs to help you plan to make your own cheese press:

Cheese Press #1

This is the most common home cheese presses. They can be purchased for around $100 or made for about half the cost. The size limited by is the size PVC pipe you can find. If you have larger moulds build it to fit.



List of parts:

6 to 8 1/4-20 nuts
1 washer
2 1/4 -20 wing nuts
1 piece 1"x 8"x 3/8" stainless steel strip
26" piece of Stainless steel 1/4-20 threaded rod
1 piece of PVC pipe 4" in diameter x 8" long
2 white polyethylene cutting boards (sometimes called nylon)
1 1/4-20 threaded bushing or embedded nut
1 1/4-20 threaded knob (try Radio Shack)
4 Rubber feet (Optional)

Directions:

Cut PVC to about 8 inched long. Cut polyethylene into the base plate (8" x 8") and 1 circle the size to slip snuggly inside the PVC. This circle will be used as a pressure plate to expel the whey. Drill a small dimple in the center of the pressure plate for the threaded rod to fit into. This will keep the rod from slipping around when pressure is applied.

Next drill 2 holes centered about 1 inch wider than the outer diameter of the PVC pipe. This will be used to hold the pressure plate in place while you turn the threaded rod to apply pressure. Drill 2 holes at the ends of the support arm at the same time so they all line up.

Drill a 1/4 inch hole in the center of the support arm.

Assembly Instructions:

Add nuts the ends of the threaded rods and slip them through the base plate from the bottom. Add a second nut to the bottom to hold the rods in place.

Set the PVC pipe in the center of the base plate and drop the pressure plate on top of the cheese. Next add the spring (if you have one, then a nut, washer and second nut over the short threaded rod. Next thread the support arm through the rod and line it up with the two outer threaded rods.

Add the two wing nuts and your ready to add pressure to your cheese!

Once you get everything assembled and working, just remove the wing nuts and slide the support arm and pressure plate assembly off to add your cheese.

Cost about $20

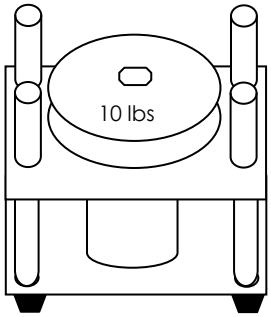
Note 1 - the knob can be made from a scrap piece of polyethylene cutting board left over from cutting the base and pressure plate and a few more nuts.

Note 2 – the spring may be omitted if you can't find one. I found mine at Ace Hardware.

Note 3 - a thicker strip of polyethylene or wood will work as a support arm if you can't find stainless.

Cheese press #2

A dowel slide press.



List of parts
2 pieces of wood plywood or hard wood 2 inches x 6 inches x 12 inches
Or
2 nylon heavy cutting boards
4 -1 inch wood dowels about 24 inches long
4 -wood screws length based on whether you've chosen wood or nylon
Wood glue
4 -1/4 x 20 washers
4 rubber feet
1 drill
¼ inch drill bit
1 inch drill bit
1-1/4 drill bit
Sandpaper

Directions:

You can make this press as big as you like but I like to press multiple cheeses at once so I made mine big enough to press 4 kadova baby Gouda molds.

Clamp boards together squarely and drill four ¼ inch holes about 2 inches from each of the corners drilling all the way through the boards.

Lay the 1 inch drill near the wood or nylon and wrap a piece of masking tape on t so that the depth of cut with only reach half way through the second board.

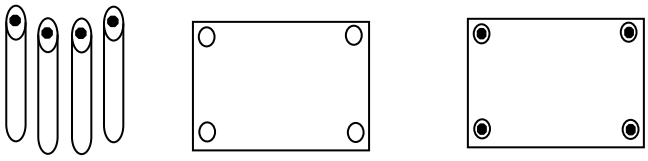
Take board using the pilot holes as your guide drill 4, 1 inch holes to the depth of the tape.

On just one board expand holes to 1-1/4 inch completely through.

Drill small pilot holes into the dowels just smaller than your wood screws.

Sand all the wood smooth or clean up the nylon if needed.

Your parts should now look like this:



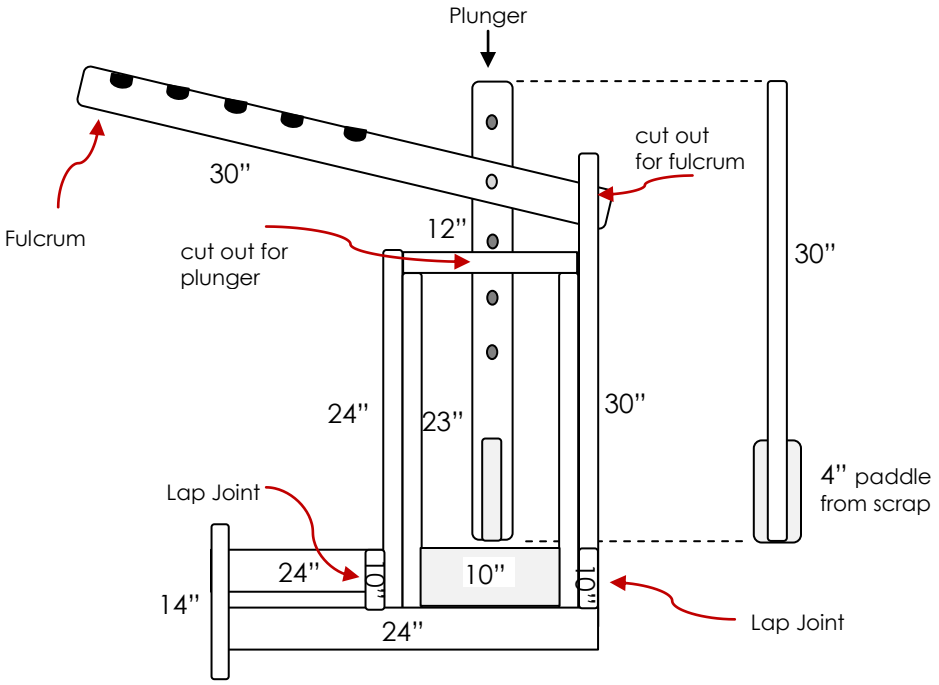
Dry fit the dowels into the board that is half drilled through. Place a washer on the screw, place the rubber foot on the screw, slid the screw through the board and thread into the dowel. If everything fits tightly disassemble and add a drop of glue or silicone if using nylon around the dowel hole and glue on the screw hole and tighten. Place a small can or something on the top of the board between the dowels.

Slide the board with the 4 holes cut through over the dowels. Loosen them if you need to in order to get a good fit. Once the board is in place tighten the screws and allow the glue to dry over night before proceeding.

You can now finish the wood if you have used wood and you ready to press some cheese! Put your cheese mold where the bean can was and weights of any type on the top.

Cheese press #3

The Dutch press.



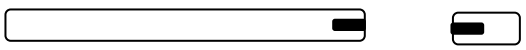
List of Parts:

24 feet of 1" x 4" solid wood (hardwood is preferred but pine can be used)
1 10 x12 x 1/2 inch white polyethylene cutting board
About 52 - 2 inch wood screws
1 – 2-1/2 inch bolt with nut and washer
1 – 4 inch bolt with nut and washer
Wood glue

Wood cuts

4 – 30 inch long pieces	3 – 24 inch long pieces	2 – 23 inch long pieces
1 – 14 inch long piece	1 – 12 inch long piece	2 – 10 inch long pieces
1 – 4 inch long piece		

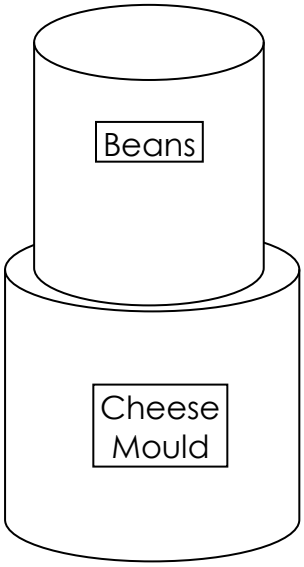
Paddle remove ½ the length and equal thickness to insert one into the other. Dry fit then glue and screw on paddle.



Cut pieces, dry fit and then glue and screw pieces together.

Cheese Press #4

For lightly pressed cheese you could find a can that fits onto your cheese follower and use that as weight or use that to hold a board or plate and add weights on top.



IV. Cheese Basics

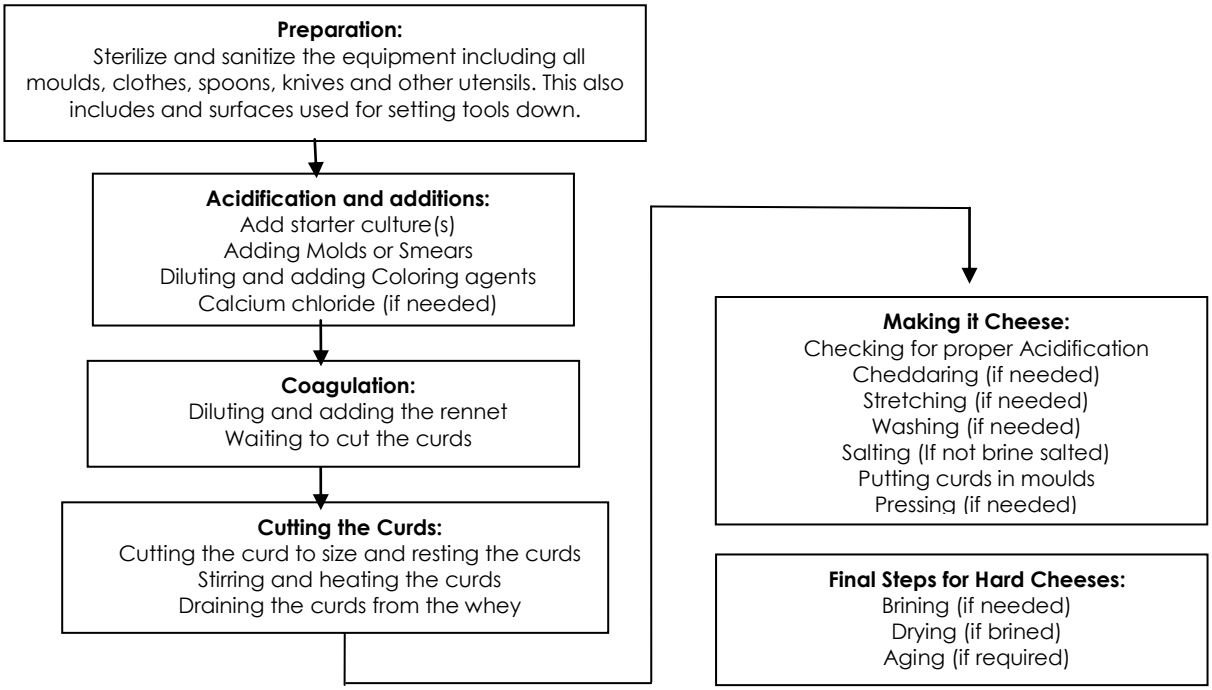
Making cheese is a simple process of talking fresh milk, adding a starter culture to acidify (lower the pH), then warming the milk to encourage growth of certain bacteria to increase acidity and adding a coagulation medium to separate the solids (curds) from the liquids (whey) and pressing them together to form a loaf of cheese.

It is easy to see that proper acid development plays a critical role in cheese making. Not enough acidity will give you soft, mushy, cheese which will weep whey weeks after pressing. Too much acidity will cause the cheese to hold on to it whey for several days which may sour the cheese.

The acidity of the milk determines when the rennet is to be added which will begin the coagulation process. In general the pH levels should be between 4.5 and 6. An inexpensive pH meter can be purchased from cheese suppliers for about $30. To get started you will not need one but it is recommended for the more advances cheeses.

There is a particular order to mixing the ingredients for making cheese. With some things the wrong order can make things go terribly wrong.

Here is the basic flow chart for making most cheeses:



Types of Starter Cultures

Starter cultures are used to convert the lactose in the milk to lactic acid. This is needed to achieve the correct pH for coagulation and determine the taste, texture and moistness of the cheese.

There are two basic types of starter cultures mesophilic and thermophilic.

Mesophilic - from the Greek word meso - which means intermediate and philic - which means loving. These cultures thrive at room temperature.

Thermophilic - from the Greek word thermo - meaning heat and philic - which means loving. These cultures require a higher temperature to become most active.

Simple mesophilic and thermophilic cultures can be made at home. Various commercially produced cultures are also available for making different more complex cheeses. Let's talk about the home made cultures first.

Making Home Made Mesophilic Starter Culture

1. Start with 2 cups of fresh or store bought Cultured Buttermilk.

2. Let the buttermilk reach room temp. 70°F (21°C).

3. Allow the buttermilk to ripen for 6 - 8 hrs. (Store bought buttermilk does not have a high enough concentration of bacteria to serve as a starter culture without ripening.)

4. The resulting buttermilk will be much thicker and sour then what you started with. It should be the consistency of fresh yogurt, if it isn't let it sit for a few more hours. This will be your home made mesophilic starter culture.

5. Pour your new culture into a full sized sterile ice cube tray and put it into your freezer.

6. Once frozen, remove the cubes and put them into a sterile sealed container or plastic freezer bag. It is a good idea to label the package because you will not be able to tell them apart from the thermophilic culture you will make next.

7. The resulting ice cubes equal about 1 ounce of mesophilic starter culture.

8. Thaw the cubes and add these to your recipes as required. The cubes will keep for about one month. Longer if vacuum sealed.

   To make more starter simply thaw one cube and add into 2 cups of fresh milk. Mix thoroughly with a fork or a whisk. Allow the milk/culture to stand at room temperature 70°F (21°C) for 16 - 24 hours or until the consistency of fresh yogurt. Then follow from step 5. Easy!

Making Home Made Thermophilic Starter Culture

1. Start with 2 cups of fresh milk. Heat it to 185°F (85°C) Be careful not heat this too high or the cream will separate.

2. Let the 2 Cups of milk cool down to at least 125°F (52°C) at room temp.

3. Add one heaping table spoon of fresh plain yogurt (either homemade or store bought. It must be labeled with "*live and active cultures.*" I like Dannon).

4. Mix the yogurt into the milk thoroughly with a fork or a whisk.

5. Keep the mixture at 110°F (44°C) for 8 -10 hours until a firm yogurt has set. This can be done by using a double boiler on a low setting or by placing the inoculated milk into a small sterile mason jar placed in a warm water bath. The bath can be kept warm by placing it on an electric range top at the lowest possible setting (so that 'ON' light is just on). Monitor the temperature closely the first few times you do this and you will become a better judge of the temperature settings of your range top. This way with future cultures you can set the process up and not worry about it for 8 -10 hours. This will be your home made thermophilic starter culture.

6. Pour this culture into a full sized sterile ice cube tray and put into your freezer.

7. Once frozen, remove the cubes and put into a sterile sealed container or plastic freezer bags. It is a good idea to label the container so will can tell the difference between it and you mesophilic culture.

8. The resulting ice cubes are about 1 ounce of thermophilic starter culture.

9. Thaw the cubes and add these to your recipes as required. The cubes will keep for about one month.

   To make more starter simply thaw one cube and use it as the fresh yogurt used in step 3.

Raw Milk Clabber (Mesophilic Culture)

If you're lucky enough to have you own cow or just have access to raw non-pasteurized, non-homogenized milk you can make clabber.

1. take some fresh raw and place it in a sterile mason jar.

2. fasten a paper towel or handkerchief to the top of the jar to prevent contamination, but allow the clabber to breathe.

3. leave the jar sit undisturbed, at room temperature for a few days.

4. After a few days you will have something that resembles a thick springy yogurt and smells like cultured buttermilk. This can be used to make any of the cheeses that call for mesophilic culture.

5. Save the last few tablespoons to make the next batch.

Commercially Available Starter Cultures

There are many cheeses that can be made from home made starter cultures but to make authentic tasting complex cheeses you need to purchase the various strains of bacteria used for the type of cheese you are making.

One of the best places I know of that sells these cultures is ***The Dairy Connection*** in Madison Wisconsin. I was lucky enough to get to meet Jeff Meier or Cathy Potter on a recent trip to Wisconsin. They are just as friendly and helpful in person as they are on the phone. http://dairyconnection.com

Another fine company your can purchase cultures from is **Glengarry Cheese Making Inc.** in Lancaster Ontario Canada. Margaret Morris is the owner operator and cheesemaker of the company and has written an excellent book called "*The Cheesemaker's Manual*" which I *highly* recommend you purchase. She even took the time to autograph my copy when I asked. She helps many new

companies design their cheese making facilities and gives lessons in cheese making a few times a year. http://glengarrycheesemaking.on.ca/index.htm

Yet another fine company in Canada is **Danlac Canada Inc.** The major player here is Egon Skovmose. A very friendly helpful man that will do his best to find you what you need. They also post informative articles related to the products they sell. http://www.danlac.com/

Cheese cultures and other enzymes come in hobby sized packets that range in price from $7 to $40. They come in small packages similar to bread yeast and must be refrigerated or frozen. They are freeze dried and will last about a year in the freezer.

Here is a list of some of the cultures available from the Dairy Connection:

Cultures, Molds and Smears				
Mesophilic Cultures				
Name	Company	Ingredients	Use	Seller
MM 100 MM101/BT001/ BT002	Ezal / Danisco	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris (LLD) Lactococcus lactis subsp. lactis biovar diacetylactis	For soft ripened, and fresh (unripened) cheeses: Brie, Camembert, Havarti, Gouda, Edam, Feta, Blue, Chevre, etc...	Dairy Connection Glengarry Danlac
MA19	Choozit	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris	Emmental, Raclette, Fontine, Saint Paulin, Tvarog, quark and sour cream	Danlac
Alps D	Choozit	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris (LLD) Lactococcus lactis subsp. lactis biovar diacetylactis (ST) Streptococcus thermophilus (LH) Lactobacillus helveticus (LBL) Lactobacillus lactis	Medium to fast acidifying culture for the production of semi-hard and hard cheese. Due to its slow citrate fermentation, only little CO2 is formed slowly.	Danlac
Aromatic Type B Meso Aromatic II Probat 222	Abiasa Choozit	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris (LLD) Lactococcus lactis subsp. lactis biovar diacetylactis (LMC) Leuconostoc mesenteroides subsp. cremoris	For use in soft goat cheeses, cottage cheeses, sour cream, cultured butter, fermented buttermilk and fresh cheeses.	Dairy Connection Glengarry

Name	Company	Ingredients	Use	Seller
MA 11 MA 14/MA16/ MA19	Abiasa	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris	For semi-soft and fresh cheeses: Cheddar, Colby, Monterey Jack, Feta, Chevre, etc...	Dairy Connection Glengarry
MA 4000	Abiasa	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris (LLD) Lactococcus lactis subsp. lactis biovar diacetylactis (ST) Streptococcus thermophilus	"Farmhouse" Culture - Cheddar, Colby, Brick, Jack, Farmers, Limburger, Camembert, Brie, Blue cheese. For quicker acid production.	Dairy Connection Glengarry Danlac
MD 89	Ezal	This culture is used to enhance flavor (buttery) and produce some small eyes in cheese such Edam or Havarti. Suggest use as a flavor enhancer for your cheese with other cultures.(LLD) Lactococccus lactis subsp. biovar diacetylactis	Used enhance the flavor in fresh cheeses and soft ripened cheeses: Brie, Camembert, Chevre, Blue	Dairy Connection Glengarry Danlac
Feta B	Choozit	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris (ST) Streptococcus thermophilus (LH) Lactobacillus helveticus (LB) Lactococcus. Bulgaricus	Feta and salted white cheese	Danlac
Flora Danica SMADL77	Chr Hansen	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris (LLD) Lactococcus lactis subsp. lactis biovar diacetylactis (LMC) Leuconostoc mesenteroides subsp. cremoris	Used for specialty cheeses, sour cream and cultured butter: Goats milk cheese, Havarti, Baby Swiss, Gouda, Edam, Blue, etc…	Dairy Connection Glengarry
Kazu	Dansco	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris (LLD) Lactococcus lactis subsp. lactis biovar diacetylactis (LH) Lactobacillus helveticus	Gouda, Edam, Havarti	Glengarry Danlac

Name	Company	Ingredients	Use	Seller
RA24/RA26	Dansco	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris (ST) Streptococcus thermophilus	Yogurt	Glengarry Danlac
MT1	Dansco	(LL) Lactococcus lactis subsp. lactis (LLC) Lactococcus lactis subsp. cremoris (ST) Streptococcus thermophilus (LBL) Lactobacillus lactis	Feta	Glengarry
Thermophilic Cultures				
Name	Company	Ingredients	Use	Seller
LH100	Dansco	(LH) Lactobacillus helveticus (LBL) Lactobacillus lactis	Used in combination with TA culture for hard cheese, Italian types and Swiss.	Dairy Connection Glengarry Danlac
Helv A	Choozit	Supplemental Culture (LH) Lactobacillus helveticus	Hard and semi hard cheese with strong aroma	Danlac
TA50/TA54 Stabilized cheese	Dansco	(ST) Streptococcus thermophilus		Glengarry
TA 61 TA60/61/62 Hard Cheese	Ezal	(ST) Streptococcus thermophilus	For hard, Italian & Swiss cheeses: Parmesan, Romano, Provolone, Mozzarella, Emmental, Swiss	Dairy Connection Glengarry Danlac
TM81	Choozit	(SST) Streptococcus salivarius subsp. thermophilus (LB) Lactococcus. Bulgaricus	Mozzarella, Pizza cheese, String cheese	Danlac
LB340	Dansco	(LB) Lactococcus. Bulgaricus		Glengarry
LM 57	Ezal	(LMC) Leuconostoc mesenteroides subsp. cremoris	This culture produces CO2 and diacetyl (butter flavor) in cheese due to citrate fermentation. Used as an enhancer for Blue cheese and Gouda along with MM Series.	Dairy ConnectionGlengarry
ABY-2C	Dansco	(ST) Streptococcus thermophilus (LB) Lactococcus. Bulgaricus (LA) Lactococcus acidoqbilus (BL) Bifidobacterium longum	Yogurt w/ Probiotic (Acidophilus) cultures. Mild flavor and thick body.	Glengarry

Name	Company	Ingredients	Use	Seller
Thermo B Culture	Abiasa	(ST) Streptococcus thermophilus (LB) Lactococcus. Bulgaricus	Thermophilic Type B Culture from Abiasa. For use in Soft and Semi-soft type cheeses.	Dairy Connection Glengarry
Thermo C Culture	Abiasa	(ST) Streptococcus thermophilus (LH) Lactobacillus helveticus	Thermophilic Type C Culture from Abiasa. For use in Italian and farmstead type cheeses.	Dairy Connection Glengarry
Molds				
Proprionibacteria	Abiasa	(PS) Proprionibacteria freudenreichii subsp. shermanii	Used primarily for the eye formation, aroma, and flavor production in Swiss type cheeses.	Dairy Connection Glengarry
Molds				
Name	Company	Ingredients	Use	Seller
Penicillum candidum VS	Choozit	VS - General use - mild flavor	Freeze-dried white mold Brie, Camembert, Colommiers, Saint Maure, etc. Produces a creamy white appearance and velvety texture.	Dairy Connection Glengarry
Penicillum candidum Neige		Neige - Higher flavor - recommended for goat cheese	Freeze-dried white mold Brie, Camembert, Colommiers, Saint Maure, etc. Produces a creamy white appearance and velvety texture.	Dairy Connection Glengarry
Penicillum roqueforti	Choozit	Penicillum roqueforti	Fast growing blue mold culture. Use for blue mold cheese such as Danablu, Roquefort and Gorgonzola.	Dairy Connection Glengarry

Name	Company	Ingredients	Use	Seller
Geotrichum candidum GEO 17		GEO 17 Mold like appearance - Very mild flavor and aroma	Used in combination with other molds. Grows rapidly on cheese surface first and aids in the formation of Penicillium candidum and Brevibacterium linens that need a neutral environment. Produces a thick, velvety surface cover with mimimal enzyme activity.	Dairy Connection Glengarry
Geotrichum candidum GEO 15		GEO 15 Yeast like appearance - Mild flavor and aroma		Dairy Connection Glengarry
Geotrichum candidum GEO 13		GEO 13 Mold like appearance - Intermediate flavor and aroma		Dairy Connection Glengarry
Red Smear and Aroma Development				
Name	Company	Ingredients	Use	Seller
Corynebacteria LR	Abiasa	LR Brevibacterium linens - Orange color	Used for the production of an orange/yellow surface color formation on cheese. Produces a characteristic "sulphur" aroma associated with such cheeses as Limburger, Brick and other washed rind and smear cheeses.	Dairy Connection Glengarry
Corynebacteria SR3	Abiasa	SR3 Brevibacterium linens - Orange color (Less aromatic than LR)		Dairy Connection Glengarry
PLA LYO 10 D	Choozit	Brevibacterium linens Arthrobacter nicotianae Debaryomyces hansenii Geotrichum candidum	Red smear and aroma cultures. Inoculation into milk before renneting.	Danlac

NOTE: These packages are actually designed for commercial use. Home cheesemakers will need to do their own measuring, dividing and experimentation.

Again websites for locating these cultures are as follows:

Dairy Connection - http://dairyconnection.com
Glengarry Cheese - http://glengarrycheesemaking.on.ca/index.htm
Danlac - http://www.danlac.com/

Testing Your Starter Cultures

Making cheese can be exciting and fun but it can also be very frustrating and disappointing if your starter cultures are not active and you've spent all that time and money only to throw it all away because the starter was bad.

The bad news is that testing your starter is simple but will delay your cheese making another day or so. The good news is you'll know they are active and will make a good batch of cheese!

So how do you test your starter cultures? Simple! Tale a clean glass and fill it with about 4 ounces of milk. Add one unit of culture to the milk, set it in an area at about 70°F (22°C) and wait 24 hours. If after 24 hours you still just have a glass of milk your cultures are dead – throw them away and either purchase or make new ones. If after 24 hours your glass of milk is the consistency of pudding and tastes similar to sour cream your starter cultures are good and it's time to make cheese!

Don't skip this step even with newly purchased starter cultures. You never know what environments they were in before they got to you. A hot UPS truck can quickly kill a freeze dried start culture. I recommend buying the expensive commercially available cultures during cooler weather where travel conditions won't be much of an issue.

Also I should mention that some store brands of yogurt and buttermilk may not contain active cultures. Read the labels they may be able to shed some light on the subject. Buttermilk brands vary from state to state and even town to town sometimes so I can't really help there but I have had great success with Dannon brand plain yogurt.

V. Let's make Our First Basic Cheese

The first cheeses we are going to make are mozzarella and ricotta. These are not only simple cheeses but using this recipe you will be able to make both of these cheeses from a single gallon of milk. There are other ways of making ether of these cheeses but this is a one milk two cheese recipe that is fast and easy!

Basic Mozzarella Cheese

Ingredients
1 gallon fresh whole milk (you can use 2% or 1% but it will not be a rich)
1-1/4 teaspoon citric acid powder
1/2 cup cool water
1/2 Junket rennet tablet
1/4 cup cool water
1/3 cup of kosher or flaked salt

Equipment
5 quart covered stainless pot with heavy bottom
1 and 2 cup Pyrex measuring cup
Thermometer, 20 F to 220 F (-20 C to 110 C)
Long bladed knife to reach to the bottom of the pot
Sterile handkerchief or heavy cheese cloth
8 inch colander
Large bowl to catch the draining whey
1000 watt microwave oven

Set the milk out at room temperature for about 1 hour. Then slow warm the milk to 88°F (31C), be very careful not to scorch the milk.

Dissolve 1-1/4 teaspoon citric acid in 1/2 cup cool water, then add this to the 88°F milk, and stir well.

Dissolve 1/2 tablet Junket Rennet into 1/4 cup cool water. Stir mixing thoroughly into warmed milk mixture. Let set undisturbed for 1-2 hours, until a clean break is achieved (*See page 6 for description of a clean break*).

Cut curd into 1/2 inch cubes. First cut in one direction then turn the pot and do it again from the opposite direction as shown in the illustration below

Warm the curds and whey over low heat, stirring gently to warm evenly and keep the curds separated until temperature reaches 108°F (42°C). Hold at 108°F (42° C) for 35 minutes, stirring every five minutes to keep curds separated and off the bottom.

Collect curds by pouring curds and whey through a fine cloth held in an 8 inch sieve over a 1 gallon container, let drain for 15 minutes. (Save the whey to make ricotta next. The recipe follows this one below).

Break up the curds, and then mix in 1 teaspoon salt.

Place 1/2 of the salted curds into 2 cup measuring cup or microwavable bowl.

Microwave on high (1000 watts) for 45 seconds (for other wattage ovens, adjust the time so that you get the desired elasticity).

Separate hot curd from container with the back of a fork, knead with hands to distribute heat evenly. It's hot wear gloves or move very fast when doing this!

Heat again for 20 more seconds. Stretch and fold to make smooth and elastic, shape into a soft ball.

Drop into cold, salt water brine of 1/3 cup salt per quart of water, let sit in refrigerator for a day, store in air tight container. This should yield about 1 pound of mozzarella. Adjust the salt to your liking in the next batch.

This is exactly what you buy at the deli floating around in a bowl of salt water.

NOTE: After soaking a cheese in a brine bath rinse off salt in plain water before you eat it or it will be very salty!!

After making your first batch don't be afraid to experiment by adding herbs to your cheese when kneading like chopped basil or dill – it adds a nice smell as well as great flavors to your cheeses. I love basil so I add it to everything!

Got Kids? After you kneed the curds it roll it into finger sized small logs and your kids will love it – it's string cheese!

We're not done yet! Remember I told you to save the whey when you made your Mozzarella? Most people dump it down the drain, but this is all we need to make our next batch of cheese! Ricotta!

Simple Ricotta Cheese from the Saved Mozzarella Whey

Place the whey left over from making your mozzarella cheese in a stainless steel pot. Cover and let sit overnight (12 to 24 hours) at room temperature to develop sufficient acidity.

The next day, heat the acidified whey over a moderate fire stirring continuously (do not let it stick or burn) until its temperature is near boiling (200°F or 95 °C). Do not let it boil over.

Remove whey from the heat. Cover and allow the "cooked" whey to cool undisturbed until it is comfortable to the touch – this will take several hours.

DO NOT STIR UP THE CURDS.

Gently scoop out most of the fine, delicate curds with the fine strainer and place in them a bowl.

Place a large strainer over a large bowl, lined with a boiled fine white cotton handkerchief or very fine clean cheese cloth. Pour the remaining whey through the cloth (it will filter through very slowly). After most of the whey has drained through, add the curds and continue to drain.

Allow the whey to drain out for 1-2 hours. Then pick up the corners of the cloth, give it s light twist and suspend the bag over the sink to allow the last of the whey to drain out of the ricotta. This will take several hours. It can be done in the refrigerator overnight.

Remove the drained ricotta from the cloth, pack into a container, cover and store in the refrigerator. Freeze or use it soon after making. Use for Lasagna, Manicotti, or Canolli …

This can yield anywhere from 2 to 10 ounces of ricotta cheese. If you would like more ricotta cheese at a time you could just make an entire batch of ricotta cheese from the milk and skip the mozzarella all together. I just like getting as much as I can from every gallon of milk and dumping it down the drain goes against the grain so to speak.

To make the yield more worthwhile you may consider making a double batch of mozzarella so you get a double batch of whey to make into ricotta later on.

VI. Simple Soft Cheeses (Mesophilic)

As we learned earlier in chapter IV Mesophilic starters are intermediate temperature activated starter cultures where we will use cultured buttermilk to create. Many of these cheeses can be made using thermophilic starters as well. It's up to you. You can make them both ways and see which you prefer.

Cottage Cheese

Cottage cheese is said to be a fool proof cheese for beginning cheesemakers. I could have started with this first but it takes more time and for a first cheese I like the mozzarella/ricotta recipe because it is quicker, easier tends to be more exciting. Cottage cheese requires more time and patience but if you love cottage cheese it's worth the effort.

There are two types of cottage cheeses small and large curd. We will start with the small curd cottage cheese. Small curd cottage cheese doesn't require rennet. It is higher in acidity and that gives it an extra tart flavor. Natural small curd cottage cheese is not readily available in stores. Commercially produced small curd cottage cheeses have rennet added to hurry the process and therefore are not truly natural small curd cottage cheeses.

Small Curd Cottage cheese

Ingredients

1 gallon fresh skimmed milk
1/4 cup fresh cultured buttermilk (the starter)

Equipment
2 pots one fitting into the other like a double boiler
Measuring cup
Thermometer
Long bladed knife
Colander

Directions:

Set the milk out at room temperature for about one hour.

Place your cooking pot (inner pot) into the warming pot (outer pot) and add the milk. Next add warm water to the warming pot until the water level is at the same level as the milk in the cooking pot.

Heat the water until the milk reaches 72°F (22°C) then stir in the buttermilk. Cover the milk and put the pots in a place where you can maintain a temperature of between 72 to 80°F (22 to 27°C) so the milk can ripen. This is obviously best done in the summer. Don't stir it, move it, look at it or touch it at all for 16 hours!

After 16 hours you need to test it for coagulation. You are looking for a clean break. Insert a clean knife straight down near the side of the pot, and then gently pull the curds toward the center of the pot. If the curds pull away cleanly from the sides it's ready to cut the curds. Ideally we would like the milk to coagulate in 20 hours so next batch use a little less buttermilk. If the milk is not properly coagulated wait another 8 hours and test it again.

If the milk hasn't coagulated after 48 hours the starter isn't any good and you need to throw away the milk and the starter. Go to 27 and learn how to test you starter cultures!

Next we cut the curds into ¼ inch cubes as illustrated on page 23. Let the curds sit undisturbed for 10 minutes.

Place the pots back on the stove and slowly heat the curds to 100°F (38°C) by raising the temperature by 1° every 5 minutes.

After 5 minutes stir the curds for 1 minute by raising the bottom curds to the top. Continue heating and stirring for 1 minute every 4 minutes making sure the curds are heated evenly and don't stick together. The temperature should only rise by 1° per minute after 10 minutes of cooking. The total time to raise the temperature from 72°F (22°C) to 100°F (38°C) should take 35 to 40 minutes.

Once the temperature reaches 100°F (38°C) increase the heat of the whey stirring every 2 minutes, to 115°F (46°C). This should take about 15 minutes.

Once the whey reaches 115°F (46°C) turn the heat down to maintain 115°F (46°C) for 20 to 30 minutes stirring constantly.

After 20 minutes check the curds for firmness but gently squeezing a curd between your fingers. The curd should not break easily. To test curds place a teaspoon of curds in a glass of ice water to chill. Remove the curd and compare it to what you know from commercially available products.

If it's not firm enough after 30 minutes raise the temperature to 120 or 125°F (49 or 52°C). Do not go above 125°F (52°C).

When the curds are firm enough place a colander in the sink and line it with several layers of boiled cheese cloth. Use a clean cup and scoop out the whey until it reaches the same level as the curds then pour the remaining curds and whey into the colander. Let the curds drain for 2 to 3 minutes.

Empty the hot water from the pot and fill it with cold water. Grab the corners of the cheese cloth and make a bag out of the cheesecloth and dip the curds into the cold water to rinse and cool the curds. Raise and lower the bag making sure all the curds are rinsed and cooled for 3 minutes.

Drain the water adding fresh water and a tray of ice cubes. Rinse and chill the curds for 5 minutes. Make sure all curds are chilled. Remove the bag and place it in the colander. Let the curds drain for at least an hour shaking the curds occasionally to keep them from matting.

Taste the curds to determine if you wish to add salt. If you do decide to add salt, put the curds in a bowl and stir in 1 teaspoon of salt.

Cottage cheese can also be creamed by adding 1/4 cup of milk, cream or half and half and stirring. This should be eaten fresh and is ready to eat as soon as it is completed.

Large Curd Cottage cheese

Large curd cottage cheese is easier to make and takes less time than the small curd type because I uses rennet. It's also sweeter because there is less acid due to the shorter coagulation time and has a higher yield than the small curd variety.

Ingredients
1 gallon skimmed milk
1 Junket Rennet tablet
1/4 cup fresh cultured buttermilk (the starter)

Equipment
2 pots one fitting into the other like a double boiler
Measuring cup
Thermometer
Long bladed knife
Colander

Directions:

Set out milk for 1 hour at room temperature.

Place your cooking pot (inner pot) into the warming pot (outer pot) and add the milk. Next add warm water to the warming pot until the water level is at the same level as the milk in the cooking pot.
Heat the water until the milk reaches 72°F (22°C) then stir in the buttermilk.

Dissolve the rennet in 1 tablespoon of cool water and add it to the milk.

Cover the milk and put the pots in a place where you can maintain a temperature of between 72 to 80°F (22 to 27°C) so the milk can ripen. Don't stir it, move it, look at it or touch it at all for 12 to 18 hours!

Test it for coagulation. You are looking for a clean break. Insert a clean knife straight down near the side of the pot, and then gently pull the curds toward the center of the pot. If the curds pull away cleanly from the sides it's ready to cut the curds. If the milk is not properly coagulated wait another 8 hours and test it again.

If the milk hasn't coagulated after 48 hours the starter isn't any good and you need to throw away the milk and the starter. Go to page 22 and learn how to test you starter cultures!

Next we cut the curds into 5/8 inch cubes as illustrated on page 23. Let the curds sit undisturbed for 4 minutes.

After 4 minutes stir the curds for 1 minute by raising the bottom curds to the top. Continue heating and stirring for 1 minute every 4 minutes making sure the curds are heated evenly and don't stick together.

Slowly raise the temperature 1° per minute until the temperature reaches 110°F (38°C) increase the heat of the whey stirring every 2 minutes, to 110°F (38°C). This should take about 5 minutes.

Once the whey reaches 110°F (38°C) it should be firm enough, if not go to 115°F (46°C) or as high as 120°F (49°C)

Test the curds for firmness but gently squeezing a curd between your fingers. The curd should not break easily. To test curds place a teaspoon of curds in a glass of ice water to chill. Remove the curd and compare it to what you know from commercially available products.

When the curds are firm enough place a colander in the sink and line it with several layers of boiled cheese cloth. Use a clean cup and scoop out the whey until it reaches the same level as the curds then pour the remaining curds and whey into the colander. Let the curds drain for 2 to 3 minutes.

Empty the hot water from the pot and fill it with cold water. Grab the corners of the cheese cloth and make a bag out of the cheesecloth and dip the curds into the cold water to rinse and cool the curds. Raise and lower the bag making sure all the curds are rinsed and cooled for 3 minutes.

Drain the water adding fresh water and a tray of ice cubes. Rinse and chill the curds for 5 minutes. Make sure all curds are chilled. Remove the bag and place it in the colander. Let the curds drain for at least an hour shaking the curds occasionally to keep them from matting.

Taste the curds to determine if you wish to add salt. If you do decide to add salt, put the curds in a bowl and stir in 1 teaspoon of salt.

Cottage cheese can also be creamed by adding 1/4 cup of milk, cream or half and half and stirring. This should be eaten fresh and is ready to eat as soon as it is completed.

Troubleshooting Cheeses

Sometimes no matter what we do we run into trouble. This table is to help you find out where it went wrong so you can do it better next time! The information applies to all cheeses not just Cottage cheese, but now that you have three types of cheese I thought it might come in handy – If anything went wrong.

I

Troubleshooting Cheese Problems		
Symptom	***Possible Causes***	***Solutions***
Sour Flavor	Too much acid	Add more starter
		Heat the curd faster after cutting
		Curds not rinsed well enough
	Undercooked curds	Cook longer
Yeasty or Moldy Taste	Unsanitary conditions	Wash all utensils, pots, and other tools and rinse completely
		Contaminated starter
		Contaminated milk
Tough Dry Curds	Too Much Cooking	Cut 10 minute off your cooking time
	To finely cut	Cut small curds 1/4" Large curds 5/8"
No Flavor	Insufficient acid development during ripening	Try using less Starter next time

Cream Cheese

Cream cheese comes in many varieties and styles. I know in the grocery store they only have high fat and low fat cream cheeses. Cream cheese can be made cooked or uncooked. The uncooked variety takes several days longer so the method you use may simply boil down to how fast you need it. We will use both methods for making our cream cheese so you can decide which you like best – both will be much richer than the store bought cream cheeses.

The flavor of cream cheese is highly dependent on what you use for cream. With most cheeses it's just fresh milk whole or skimmed. Not many choices here – but with cream cheese there are many different types of cream. Your cream cheese richness will depend on the type of cream you choose.

Cooked Curd Cream Cheese

Ingredients

1 quart Half and Half
1/2 pint whipping cream (to raise butterfat content)
1/2 tablet Junket Rennet
Cultured Buttermilk
1 tablespoon salt

Equipment
2 quart stainless steel double boiler sauce pan
Muslin drain bag (9" x 18" rectangle, folded in half and sewn up one side)

Directions

Put Half and Half in the double boiler sauce pan and add whipping cream. Slowly raise temperature to 72°F (22°C) then stir in 1 tablespoon of cultured buttermilk.

Dissolve rennet in 1 cup of cool water. Once dissolved add 1/4 teaspoon to the cream. Cover and set where it will maintain 72°F (22°C). It should set in about 12 to 16 hours.

Once set heat the curd slowly to 130°F (55°C) stirring gently. Hold this temperature for 45 minutes. It will start to look like a thick soup.

Next allow the curds to cool to 90°F (32°C) and stir in 1 tablespoon of salt. After salting place curds in the refrigerator and chill to 40°F (5°C).

Holding the drain bag over the sink pour chilled curds into the bag. Tie a rubber band close to the curds and drain for about 2 hours – until the whey has just about stopped dripping. Gently squeeze the bag to expel excess whey.

Fill a colander half full with ice cubes and place it in a pan. Put a small plate on top of the bag and weigh it down with a clean brick, cover the pan and set it into the refrigerator to drain for 24 hours.

Uncooked Curd Cream Cheese

Ingredients

1 quart Half and Half
1/2 pint whipping cream (to raise butterfat content)
1/2 tablet Junket Rennet
Cultured Buttermilk
1-1/2 teaspoons salt

Equipment
2 quart stainless steel double boiler sauce pan
Muslin cloth

Directions

Put Half and Half in the double boiler sauce pan and add whipping cream. Slowly raise temperature to 72°F (22°C) then stir in 1 tablespoon of cultured buttermilk.

Dissolve rennet in 1 cup of cool water. Once dissolved add 1/4 teaspoon to the cream. Cover and set where it will maintain 72°F (22°C). It should set in about 18 hours.

Once set break the curds with a spoon stirring gently. Line colander with muslin and pour curds into colander draining for about 1 hour.

Fill a colander half full with ice cubes and place it in a pan. Put a small plate on top of the bag and weigh it down with a clean brick, keep ice around the curds until dry - 24 to 48 hours. Stir in about 1-1/2 teaspoons of salt and refrigerate until use.

Sour Cream (Cultured Cream)

Sour cream is not really a cheese but the argument can be made that it pretty much fits the criteria to be considered a cheese. Whatever you choose to call it - it is a coagulated milk product so I have included it here right after the cream cheese. Besides it's easy to make and can have similar uses to cream cheese.

Ingredients
1 pint whipping cream
1 cup whole milk
1 tablespoon plus 1 teaspoon Cultured buttermilk

Equipment
2 half pint canning jars and lids
Thermometer

Directions

Sterilize jars and lids and allow to cool.

In a clean bowl mix cream, milk and buttermilk. Pour into jars, close jars and set in a place to keep them at 72°F (22°C) for 16 to 18 hours.

Stir up the sour cream and refrigerate for 48 hours. Add salt just before using.

That's it! I told you it was easy!

Neufchatel Cheese (Farmers Cheese)

I like this simple cheese for making dips or mixing with chopped meats like salami or pepperoni and spreading on crackers. It's also good for adding to your cheese cake recipes or stuffing jalapeno to make poppers. If you've never used it – it's worth a try. It can be used for many different deserts and main dishes alike.

Ingredients
1 gallon whole milk
1/4 cup Cultured Buttermilk
1/4 Junket Rennet tablet

Equipment
5 quart stainless steel pot
Whisk (for stirring not whipping)
Thermometer
Colander
1 gallon bowl
Handkerchief or muslin cloth
Long knife for cutting curds

Directions
Pour milk into the pot and heat to 65° F (18°C) stirring constantly.

Dissolve 1/4 tablet rennet in 1/4 cup water. When the milk reaches 65° F (18°C), remove it from heat, add buttermilk, whisk and stir in rennet.

Cover and let it sit undisturbed overnight at room temperature about 65-70°F (18- 20C).

Next morning you should find a clean break if not let it sit up to 12 more hours. When a clean break is achieved, cut the curd into 1/2 inch cubes.

Line the colander with the sterile handkerchief and place it over a 1 gallon bowl. Ladle the curds and whey into the colander to drain.

This is yet another recipe where you can save the whey for ricotta if you wish.

When most of the whey has drained through, pick up the four corners of the cloth and hang the curd in a cool place to drain overnight in the refrigerator.
The next day, remove the cheese and mix in1- 2 teaspoons of salt. It may be eaten immediately. Store covered in the refrigerator until use.

Queso Fresco

Ingredients
2 quarts whole milk
1 quart cultured buttermilk
1 Junket Rennet tablet
7 teaspoons white vinegar

Equipment
1 gallon stainless steel pot
Thermometer

Cheesecloth for draining
Colander
Long knife for cutting curds

Directions
Heat milk to 145°F (63°C) for 30 minutes. Do not exceed145°F.

Dissolve Junket Rennet into 1/2 cup cold tap water.

Mix one quart cultured buttermilk with two quarts cold whole milk. Add 7 teaspoons white vinegar and Mix well.

Heat to 90F (32°C). Remove pan from the heat and add rennet and mix for about 2 minutes.

Let stand for 30–40 minutes until curd is firm.

Cut curd into 1-inch cubes and let stand for about 5 minutes.

Heat curds and whey without stirring to 115°F (46°C), then remove from heat and let stand for 5 minutes.

Line colander with cheesecloth and drain for about 5 minutes.

Form curd into a ball with cheesecloth and twist the end gently to squeeze out the excess whey.

Place curds in cheese cloth in a bowl break up curds and add 1-1/2 teaspoons of salt. Mix in salt and let stand for 5 minutes, and then squeeze again.

Refrigerate until used.

Feta Cheese

Feta is a Greek cheese origin was originally made with either sheep's milk or a mixture of sheep and goat's milk. Most grocery stores sell Feta made from cow's milk. If you have access to goat's milk, try it both ways.

The cheese gets salty from aging in salt water for up to a month. If a real crumbly version is desired it can be aged even longer.

Ingredients

1 Gallon Fresh Milk
2 ounces Mesophilic Starter Culture
1/4 tab Junket Rennet tablet

Equipment

1 gallon stainless steel pot
Thermometer
Cheesecloth for draining
Colander
Whisk
Long knife for cutting curds

Directions

Warm the milk to 85 F (29.5 C) and Add 2 oz of mesophilic starter culture and mix thoroughly with a whisk, the culture must be uniform throughout the milk.

Allow the milk to ripen for two hours

Dissolve 1/4 tab rennet into 3-4 table spoons cool water. Slowly pour the rennet into the milk stirring constantly with a whisk stirring for at least 5 minutes.

Allow the milk to set for 1-2 hours until a firm curd is set and a clean break is achieved then curds into 1/2 inch cubes.

Allow the curds to sit for 10 minutes to firm up.

Stir the curds gently and cut any pieces that are bigger then 1/2 inch cubes.

Allow the curds to sit for 30 minutes, stirring every so often.

Line a colander with cheesecloth and drain the curds. Tie the corners of the cheesecloth together and drain for 5 hours.

Make up a brine solution by dissolving 1.5 cups of salt into one quart warm water. Cool the brine in your freezer, until ready to use. Some salt will precipitate out but this is okay.

Remover the cheese from the cloth and stuff it into a covered rectangular container and chill in your refrigerator for about 90 minutes.

Remove from the refrigerator and cut into 1 inch cubes.

Place the cubes in the ice cold brine solution for 5 to 30 days and store in your refrigerator. The longer you age it like this the more crumbly it will be.

After aging in the brine, remove the cubes and pat dry with a paper towel. The cheese can now be served or stored in an air tight container.

VII. What's Better Then Cheddar?

Almost everyone loves cheddar. It may be the most popular cheese in the US. Cheddar has inspired many other popular cheese in this country and we are about to start making these now.

Cheddar and Cheddar Cheese Curds

Cheese curds are a bit sized chunks of fresh cheddar cheese curds that "squeak" when you chew them giving them the affectionate nickname "Squeaky Cheese." They are very popular in the Mid-West and sold in most cheese stores. Cheese curds or "Squeaky Cheese" come from the first stage of making cheddar – so I've included it here.

Ingredients
1 Gallon Fresh Milk
1 Junket Rennet tablet
1 Tablespoon Salt
1 oz. Mesophilic Starter Culture

Equipment
1 gallon stainless steel double boiler
Thermometer
Cheesecloth for draining
Colander
Whisk
Long knife for cutting curds

Directions
Using a double boiler, warm the milk to 90°F (32°C).

Add starter culture and mix thoroughly with a whisk.

Allow the milk to ripen for one hour.

Dissolve 1 rennet tablet in 3-4 tablespoons cool water then slowly pour the rennet into the milk stirring constantly with a whisk. Stir for at least 5 minutes.

Allow the milk to set for 1-2 hours until a firm curd is set and a clean break is obtained.

With a long knife, cut the curds into 1/4 inch cubes then allow the curds to sit for 15 minutes to firm up.

Slowly raise the temperature of the milk to 102°F (39°C) over a 45 minute period, gently stirring every few minutes so the curds don't stick together. Cook the curds at 102°F (39°C) for another 45 minutes, gently stirring the curds.

Quickly drain the whey by pouring through cheesecloth lined colander. Don't allow the curds to mat.

NOTE: If you are making cheese curds stop here – If you are making a block of cheddar cheese continue through the remaining steps.

Place the curds back in the double boiler at 102°F (39°C). Stir the curds to separate any pieces that may have matted. Add the tablespoon of salt and mix thoroughly.

Cook the curds at 102° F (39°C) for one hour, stirring every few minutes.

Place the curds in a cheese cloth lined press. Press the cheese at about 20 lbs. pressure for 45 minutes.

Remove the cheese from the press and turn it over and press the cheese at about 40 lbs. pressure for 3 hours.

Remove the cheese from the press and turn it over again. Press the cheese at about 50 lbs. pressure for 24 hours.

Remove the cheese from the press. Place the cheese on a cheese board and dry at room temperature for 3-5 days, until the cheese is dry to the touch.

Wax the cheese and age it in your refrigerator for 3-24 months. The longer the cheese is aged the sharper the flavor. Be sure to turn the cheese over every few days so it will dry evenly.

NOTE: If you want to make flavored cheddars like horseradish cheddar or jalapeno cheddar the time to add the additions is just before the first pressing. Sprinkle your additional ingredients over the curds and mix until they appear consistent through the curds – then add the curds to the press.

If adding meats like sausage or pepperoni make sure they are chopped very fine so they can be evenly distributed through the cheese but not over power

it. Cheddar is also very good mixed with other cheese like Monterey Jack which is the next recipe we will be making.

Monterey Jack Cheese

Monterey Jack is a Jack cheese created in Monterey California. It has a light flavor and chewy texture making it great for sandwiches and with a low melting point is make a good choice for dips.

Ingredients

1 Gallon Fresh Milk
1 Junket Rennet tablet
2 Tablespoon Salt
1 oz. Mesophilic Starter Culture

Equipment

1 gallon stainless steel double boiler
Thermometer
Cheesecloth for draining
Colander
Whisk
Long knife for cutting curds

Directions

Heat milk to 88-90°F (31-32°C). Add starter culture and ripen with culture for 1-1/2 hours.

Add rennet dissolved in a few teaspoons of cool water. Wait for a clean break then cut into 3/8" pea-sized curds - about 1 to 2 hours. Settle curds after cutting for 5 minutes.

Stir and heat curds at the rate of 1° every 4 minutes to 95°F (35°C) over 30 minutes. Continue stirring and heating the curds at the rate of 1° every 2 minutes or 10° in 15 minutes.

Cook at 102° F (39°C) for 45-60 minutes until the curds bounce off your hand and are springy when squeezed. Whey pH 6.1-6.2. Settle curds under the whey for 15 minutes.

Drain off the whey catching it in a large bowl. Move curds slowly to the sides of the pot to form a pack. Pour whey back into the pot being careful not to disturb the curds until one inch of whey stands above the curds.

Add cold water and stir the curds in the whey until the temperature decreases to 86°F (30°C). Stir an additional 5 minutes

Drain off the remaining whey and form a ball with the cheese cloth to let the whey escape from the curds. Whey pH 5.9-6.0

Add salt when the majority of the whey has run off the curds. Use kosher salt about 1-1/2 teaspoons of salt at a time. Salt amount will vary with cheese yield.

Add the salt in 2 applications and wait 5-10 minutes between each addition. The idea is to let enough salt dissolve into the curds before pressing the curds.

Gather the curds into the press lined with cheese cloth with enough pressure to create a smooth rind by the next morning. This is 25 lbs. to start.

After 30 minutes take off the pressure and tighten the cheese cloths around the cheese. Press again at the same rate overnight.

Remove from the press and take the cheese out of the forms. The cheeses can be vacuum sealed or waxed. If muslin cheese cloth is used, it can be left on the rind and waxed over.

Monterey Jack is a mild cheese and is usually made from pasteurized milk and sold within 30 days of making. It will keep for about 90 days.

The cheese can also be made from raw milk and aged as a cloth-bound or naturally rinded cheese. Dry Jack is made by aging the cheese and rubbing it periodically with oil and pigments such as cocoa powder. Dry Jack can be aged for years.

Baby Swiss

Baby Swiss is in flavor milder and has smaller eyes than a regular Swiss cheese.

Ingredients
1 gallon fresh milk
1/4 teaspoon Thermophilic Type C Culture
1/4 teaspoon Proprionibacteria
1 tablet Junket Rennet

Equipment
1 gallon stainless steel double boiler
Thermometer
Cheesecloth for draining
Colander
Whisk
Long knife for cutting curds

Directions:
Warm milk to 95°F (35°C). 2) Add a few teaspoons of milk to the Thermophilic Type C Culture, stir and whisk thoroughly into milk, let sit 20 minutes.

Dissolve 1/2 tablet rennet in 1/4 cup fresh cool water. Stir the dissolved rennet into the milk and cover undisturbed for about 30 minutes or until a clean break is achieved.

Cut the curd in 1/8th inch strips then whisk the strips so the curds are cut. Final curd pieces should be the size of grain. Maintain temperature at 95°F (35°C).

Hold the temp at 95°F (35°C) for 30-40 more minutes, and then slowly increase the temperature while stirring to 125°F (52°C). Hold at 125 °F (52°C) for an additional 45 minutes.

Test curds by squeezing a handful of curds into a ball. If it breaks up when rubbed between your palms, it is done. Let curds settle, dip off some whey. Slowly pour curds into a colander lined with cheese cloth over in a bowl to catch the whey.

Pick up the cheese cloth, dip into whey to loosen curds, and then set in cheese press. Press for five minutes, remove the curd, replace the cloth, and press for three more hours.

Rinse cheese cloth in brine, replace the cloth and in press for three more hours. Repeat rinsing the cloth in brine and pressing the curds for three more hours. Repeat rinsing the cloth in brine and press overnight.

Prepare saturated salt brine: dissolve 5 Tablespoons salt in 16 oz water. Pour into a plastic container slightly wider than the cheese, cool the salt solution down to 45°F (7°C). Float cheese in brine water for two days at 45°F (7°C) turning the cheese each day and sprinkling the surface of the cheese with salt.

After 2 days, place cheese on board at 50-55°F (10-13°C), 90% humidity, wiping the board clean and dry every day for 10 days.

Wipe the cheese with salt soaked cloth and turn. Rub the cheese with salt at the end of 10 days.

Move cheese to 70°F (21°C), 70-80 % humidity. Wipe with clean salt water twice a week for 45 days. The cheese will plump up as the CO_2 begins to form the holes Swiss cheese is known for.

Final curing will take 4 months to a year at 40-45°F (4-7°C).

This cheese can be waxed after completion of eye formation.

VIII. Old World Styled Cheeses (Thermophilic)

Just for a bit of a change we are going to make a few Thermophilic cheeses. These cheeses will require a cheese press. Some of the best examples of thermophilic cheeses I know of are *old world Italian styled cheeses*. They are actually very easy to make but they have to be dried and aged - and that is the hard part!

As you may recall from chapter IV thermophilic means heat loving – so these cheeses will require a bit more heat up front to active the starter cultures.

Parmesan Cheese

Parmesan is named after an area in Italy called Parma. It is one of the world's most popular and widely used cheeses. It's made from skimmed milk, and must be aged at least 5 months and up to 2 years.

Ingredients

1 gallon fresh skimmed milk (no more than 2.5% butterfat
1 Junket Rennet Tablet
3 oz. thermophilic starter culture
1.5 cups salt
1 quart ice water

Equipment

5 quart stainless steel pot
Thermometer
Long knife for cutting curds
Whisk
Measuring cup
Cheese cloth
Colander
Cheese press

Directions

Warm the milk to 100° F (38° C) add starter and allow the mixture to ripen for 45 minutes.

Dissolve rennet in 4 table spoons cool water then add the rennet to the milk stirring constantly with a whisk. Stir for at least 5 minutes.

Allow the milk to set for 45-90 minutes until a firm curd is set and a clean break can be achieved. With a long knife, cut the curds into 1/4 inch cubes.

Allow the curds to sit for 10 minutes to firm up.

Gently stir the curds so they don't matt together every few minutes while slowly raising the temperature of the milk to 124°F (52° C). This should take about 45 minutes. Maintain this temperature for another 15-30 minutes until the curds are very small and firm.

Line a colander with cheesecloth and drain the whey.

Place the drained curds into your press lined with cheesecloth. Apply about 10 pounds of pressure for 30 minutes.

Remove the cheese from the press and flip it and press the cheese at about 25 pounds of pressure for 12 hours. Carefully remove the cheese from the press.

Dissolve 1.5 cups of salt into one quart warm water. Cool the brine in the freezer. Some salt will precipitate out this is normal.

Float the cheese in a cold brine solution for 30 hours flipping the cheese over about every 10 hours or so to development an even rind.

Pat the cheese dry with paper towels. At this point you should notice the surface of the cheese has begun to harder. This is cal the rind.

Place the cheese in your refrigerator to age for a minimum of five months to a maximum of 2 years. The longer it ages the stronger the flavor.

NOTE: You will need to flip the cheese over every day for the first two weeks and then at least once a week after that for even drying.

Place an overturned bowl on top of the cheese after two days while it ages and dries. Do not wrap it in plastic.

Inspect the cheese daily for mold. If mold should begin to develop on the cheese, simply remove it using a paper towel dipped in white vinegar.

After three, six and nine months of aging, rub the surface of the cheese with a good quality olive oil. Do not wax this cheese.

NOTE: The first time you make these cheeses use your home made starter cultures. Then in a later batch - if you want - you could buy some of the commercial starter from the Dairy Connection and see if you detect a difference. I will add recipes later in the eBook that use these cultures exclusively.

Romano Cheese

Romano is one of oldest recorded cheeses and has been made near Rome since the time of Christ. This cheese must also age at least 5 months just like Parmesan. A longer time is used to produce a harder grating cheese. I like to grate half parmesan and half Romano for topping spaghetti and soups.

Ingredients

2 quarts fresh skimmed milk
2 quarts fresh goats milk
1 Junket Rennet Tablet
5 oz. thermophilic starter culture
1.5 cups salt
1 quart ice water

1 gallon fresh skimmed milk may be used if goats milk is not available

Equipment

5 quart stainless steel pot
Thermometer
Long knife for cutting curds
Whisk
Measuring cup
Cheese cloth
Colander
Cheese press

Directions

Warm the milk to 90° F (32° C) add starter and allow the mixture to ripen for 15 minutes.

Dissolve rennet in 4 table spoons cool water then add the rennet to the milk stirring constantly with a whisk. Stir for at least 5 minutes.

Allow the milk to set for 45-90 minutes until a firm curd is set and a clean break can be achieved. With a long knife, cut the curds into 1/4 inch cubes.

Allow the curds to sit for 10 minutes to firm up.

Gently stir the curds so they don't matt together every few minutes while slowly raising the temperature of the milk to 115°F (46° C). This should take about 45 minutes. Maintain this temperature for another 30-45 minutes until the curds are very small and firm.

Line a colander with cheesecloth and drain the whey.

Place the drained curds into your press lined with cheesecloth. Apply about 10 pounds of pressure for 30 minutes.

Remove the cheese from the press and flip it and press the cheese at about 25 pounds of pressure for 3 hours. Carefully remove the cheese from the press.

Remove the cheese from the press and flip it and press the cheese again at about 40 pounds of pressure for 12 hours. Carefully remove the cheese from the press.

Dissolve 1.5 cups of salt into one quart warm water. Cool the brine in the freezer. Some salt will precipitate out this is normal.

Lightly pierce the entire surface of the cheese with a fork, so that the cheese is covered in small shallow holes spaced about 1/2 inch apart.

Float the cheese in a cold brine solution for 30 hours flipping the cheese over about every 10 hours or so to development an even rind.

Pat the cheese dry with paper towels. At this point you should notice the surface of the cheese has begun to harder. This is cal the rind.

Place the cheese in your refrigerator to age for a minimum of five months to a maximum of 2 years. The longer it ages the stronger the flavor.

NOTE: You will need to flip the cheese over every day for the first two weeks and then at least once a week after that for even drying.

Place an overturned bowl on top of the cheese after two days while it ages and dries. Do not wrap it in plastic.

Inspect the cheese daily for mold. If mold should begin to develop on the cheese, simply remove it using a paper towel dipped in white vinegar.

After three months of aging, the surface of the cheese may be rubbed with a good quality olive oil. Do not wax this cheese.

Asiago Cheese

I love Asiago cheese! It great for sprinkling on breads, pastas, salads and pizza! Another of the simple hard cheeses but it requires some aging.

Ingredients
1 gallon Whole Milk
3 oz. thermophilic starter culture
1 Junket Rennet Tablet

Equipment
5 quart stainless steel pot
Thermometer
Long knife for cutting curds
Whisk
Measuring cup
Cheese cloth
Colander
Cheese press

Directions
Let milk warm to room temperature then heat the milk to 89-93 °F (32-34°C) add starter cultures and let sit for 30 to 45 minutes.

Add rennet and wait for curding. Cut curd into corn kernel-sized pieced.

Slowly heat curds and whey while stirring until they reach 104°F (40°C) over 20 minutes.

Cook at 104°F (40°C) for 15 to 20 minutes until curds are no longer sticking.

Heat to 116 -118 °F (46-48°C) over 20 minutes. Cook at this temperature until curd is firm very springy and easy to rub apart in the palms of your hand, then allow curds to settle to the bottom of the pot for 20-30 minutes.

Gather all curds in a cake and drag a coarse cheese cloth underneath to bind them. Lift curd cake out of vat in the cloth and let the whey drain off for a few minutes.

Divide curd cake into pieces that will fit into your press forms. Press for about one hour until the wheels are formed.

Take off press, remove cloths, turn wheels, and replace with smooth cloths dipped in brine, and press again.
Turn wheels 1-2 more times during pressing if possible. Leave on press overnight at 72-76 °F (22-25°C).

Next morning remove wheels from press and move to an area 50-55°F (10-13°C). After 24 hours, brine the wheels for 4-5 hours per pound of cheese. Turn the wheels in the brine once per day and sprinkle dry salt on the tops
Aging at 55-59 °F and 85% Relative Humidity with moderate ventilation:

After removing from brine scrub rinds with a brush dipped in saturated brine or rub by hand with dry salt every 3-4 days for 2 months.

Turn the cheeses over every time you do this. After 2 months, the scrubbing or rubbing can be done just enough to prevent discoloration. The rind will become harder and leathery and change from straw-colored to light brown.

This cheese can age for 2 years or more and will have a darker brownish colored rind.

Defects may be observed after two months when the cheeses become huffed and gassy inside. The cheeses may even split apart because of excessive gas formation.

The flavor should be more like "Swiss" and the texture very open with lots of gas holes and lateral slits. This is due to a high level of Propionic bacteria in the milk and is common if the salt content is too low and/or aging room temperature is too high.

Provolone Cheese

Last but certainly not least is one of my favorite cheeses. I use young provolone on anything you would put cheese on. If you only had provolone from a grocery store you have never really had real provolone! I highly recommend making a double batch, waxing and hanging it for a year or more. When it's done it will have a smell not unlike old gym socks and a bite that will clear you sinuses – you can't beat it! Aged provolone can be grated and used just like parmesan or eaten with fresh Italian bread, pepperoni and red wine for a special treat.

Ingredients
1 gallon Whole Milk
1/4 tsp EZAL TA062 + 1U EZAL LB100

Equipment
5 quart stainless steel pot
Thermometer

Long knife for cutting curds
Whisk
Measuring cup
Cheese cloth
Colander
Cheese press

Directions

Heat the raw milk to 90-93° F (32-34°C).

Add starter culture dissolved in 4 tablespoons of cool water.

After 1-1.5 hours add rennet.

Measure the curdling point and multiply this times 3 to get the time to wait from adding rennet to cutting the curd, e.g., 12 min. x 3 = 36 minutes.

Cut the curds into particles the size of corn kernels. Rest the curds for 5 minutes.

Begin heating, while stirring the curds and whey, steadily to 95-98°F (35-37°C) in 15 minutes. Continue heating to114 -118°F (45-48°C). Total heating time is 45 minutes

Cook at 114 -118° F (45-48°C) until the curds are springy and firm.

Settle the curds under the whey for 15-30 minutes. Rake curds to the back of the vat and drain off the whey. Keep the curds in a pack, and then slice into slabs. Pile the slabs on top of each other until the acidity increases so that they are ready to stretch into shapes.

Do a "stretch test" to determine this. Trim off a few small pieces of curd and immerse them in 170° F (76°C) water for a few minutes. After kneading them together, you should be able to pull the curd into a shiny string.

After molding the cheeses, put them in cold water to firm up before brining. Brine in a saturated salt brine at 50-55°F (10-13°C) for 2 hours per lb. for cheese less than 5 lb., 3 hours per lb. for cheese 5-10 lb., and 4 hours per lb. for 10 lb. and over.

After brining, age as natural rind or in wax at 50-60° F (10-15°C) and 85% Relative Humidity.

Cheese and Sausage Caves

What is a cheese and sausage cave? A cheese and sausage cave is an environmentally controlled area where cheeses and sausages are stored to age and dry. These caves can be made for the home cheese and sausage maker to age their cheeses or sausage by adding a few items to a normal refrigerator.

Before we get into the making of a cave let's discuss a few things we need to be able to control for the proper aging of cheeses and sausages.

For a proper cheese cave we'll need to set and control the following:

1) Temperature – as close to 45 to 58°F (7 to 14°C) as possible
2) Moisture level – humidity should be between 80-98%
3) Fresh Air to remove various gases produced during aging

For a proper sausage cave we'll need to set and control the following:

1) Temperature – as close to 55 to 60°F (12 to 15°C) as possible
2) Moisture level – humidity should be between 70-80%
3) Fresh Air to remove various gases produced during aging

The criteria are pretty close for both the sausage cave and the cheese cave so I think we can work within those ranges fairly comfortably.

Parts I opted for are as follows:

Johnson Control FE22 Refrigerator Thermostat - set point temperature between 30 and 80°F, with 1 degree increments. The Johnson Control thermostat has a 3 1/2 degree differential, which means that the thermostat will shut the fridge or freezer off (stop cooling) at 3 1/2 degrees below the set point and start the unit (resume cooling) once internal air temperature exceeds the set point.

Johnson Control A419 is a digital version of the Refrigerator Thermostat which has about the same specs as the FE22 but with a digital readout.

Honeywell TM005X Wireless Thermo-Hygrometer - Wireless sensor unit can monitor up to three remote locations. The TM005X comes with one remote sensor, but two additional sensors can be purchased separately has transmission range of up to 100 feet. Measures temperatures to as low as minus 38 degrees Fahrenheit and up to 158 degrees Fahrenheit.

Timex TX1012 Wall-Mountable Thermometer and Hygrometer $5 Sturdy wall-mountable thermometer/hygrometer for indoor/ outdoor use Plastic case with rear hanger hole is durable and weatherproof Reads temperature from -30 to 110 degrees F (accurate to within +/- 2 degrees) Reads relative humidity from 10 to 90 percent; attaches to any wall surface.

This is a just backup to the Honeywell digital in case the batteries go dead.

Okay so now we can control and monitor the temperature of our dedicated refrigerator … er cheese and sausage cave. How do we adjust the humidity?

Generally we need to add moisture to the cave and that can be done by adding a covered bowl or water, a damp towel or spraying sterile water on the walls to get things started.

As the seasons change you will find the humidity levels change also by watching your hygrometer(s) you'll know if you need to make adjustments to your setup.

Run the new cave for a few days and make minor adjustments until you know what affect they will have on the cave environment. Keep in mind that the humidity levels will change drastically after adding a batch of sausage or a few block of cheese – at least for a few days.

In any case one thing you'll have to do is bring the sensor for the Thermostat into the refrigerator. You do this by drilling a small hole about the size of the probe – BUT you can't just go drilling into the refrigerator. There are all kind of things, wires, compressors, cooling tubes etc. running around in the walls of that refrigerator. The safest way to do it is to make a small cut into the door gasket just big enough to get the wire into and slip the probe in through that.

That's it! You now have a cheese and sausage cave.

Appendix

Cheese Additives

Calcium Chloride Improves curd size and texture when using store bought milk.

Citric Acid Used to increase acidity when necessary

Tartaric Acid Used with light cream to make fresh mascarpone desert cheese

Flaked Cheese Salt Specialty grade additive free pure salt for seasoning cheese, canning, hot sauces and mustards. Enhances flavor, inhibits spoilage.

Lipase

Lipase enzymes enhance the flavor of Italian and specialty type cheeses. Enzyme is a "must" for the manufacture of cheeses like Feta, Romano, Pecorino, Parmesan, Mozzarella, etc. Without lipase, the cheese will never develop the favor you may expect from the particular cheese.

Calf Lipase – Characteristically Mild "picante" used for Mozzarella, Asiago, Provolone, Feta, Blue cheese

Kid Lipase – Characteristically Sharp "picante" used for Romano, Provolone

Kid/Lamb Lipase – Characteristically Traditional "pecorino" used for Romano, Provolone, and Feta

Lamb – Characteristically Very sharp - "pecorino" used for Romano

Cheese Conversions	Dairy Conversions
1 Gallon = 3.785 Liters	2.27 Pounds = 1 Liter Cow Or Goat Milk
0.26 Gallon = 1 Liter	2.31 Pounds = 1 Liter Sheep Milk
1 Ounce = 28 Milliliters	1.03 Kilogram = 1 Liter Cow Or Goat Milk
1 Pound = 454 Grams	1.05 Kilogram = 1 Liter Sheep Milk
2.2 Pounds = 1 Kilogram	8.6 Pounds = 1 Gallon Cow Or Goat Milk
	8.74 Pounds = 1 Gallon Sheep Milk

Cheese Making Record

Cheese:			Date:
Milk:	*Amount Used:*	*Description:*	
Type & Quantities of Milk:			
Type & Quantities of Milk:			

Bacterial Cultures:	*Name/Amount Used:*	*Bacterial Culture Data:*		*pH / TA*
Primary Culture #1:		Time/Temperature Added:		
Primary Culture #2:		Time/Temperature Added:		
Primary Culture #3:		Time/Temperature Added:		
Secondary Culture #1:		Time/Temperature Added:		
Secondary Culture #2:		Time/Temperature Added:		
Secondary Culture #3:		Time/Temperature Added:		

Other:	*Name/Amount Used:*	*Other Additions Data:*		*pH / TA*
Calcium Chlroride:		Time/Temperature Added:		
Ammato:		Time/Temperature Added:		
Molds:		Time/Temperature Added:		
Molds:		Time/Temperature Added:		
Aroma Cultures:		Time/Temperature Added:		

Coagualtion Agent:	*Name/Amount Used:*	*Coagulation Data:*		*pH / TA*
Rennet:		Time/Temperature Added:		
Temperature at Renneting:		Time/Temperature Added:		
Flocculation Time:		Time/Temperature Added:		

Curds:		*Curd Data:*		*pH / TA*
Initial Curd Size:		Time/Temperature Cut:		
Resting Period:		Time/Temperature Rested:		
Cooking Time/Temperature:		Time/Temperature Stirred:		
Final Curd Size:		Final Cut Time/Temperature:		
Cooking /Sirring Time:		Time/Temperature:		
Washing:		Time/Temperature:		
Agent Used/ Amonut:		Time/Temperature:		
Draining/Milling:Curd:		Time/Temperature:		

Pressing:	*Weight / Time*	*Aging/Affinage:*		*pH / TA*
Mold used:		Drying Time/ Temperature:		
First Pressing:		Aging Time/Humidity:		
Second Pressing :		Minimum Aging Time:		
Third Pressing:		Actual Aging Time:		

Tasting Notes - Age:	Tasting Notes - Age:	Tasting Notes - Age:	Tasting Notes - Age:	Tasting Notes - Age:
Flavor:	Flavor:	Flavor:	Flavor:	Flavor:
Texture:	Texture:	Texture:	Texture:	Texture:
Moisture:	Moisture:	Moisture:	Moisture:	Moisture:

Notes: