



Cheese mold cultures

The launch of the following four cheese cultures for making French-style cheeses provides cheesemakers with a whole new range of possibilities:

- *Bacterium linens*
- *Penicillium roqueforti*
- *Bacterium propioni*
- *Penicillium candidum*

Some important guidelines

- Each packet of culture is sufficient for 500 litres of milk.
- The culture does not just incubate cheese, but also whey. Very little is needed for traces to be left behind on equipment, cheese boards and in cheese storage areas.
- When preparing these sorts of cheeses the strictest hygiene standards should be followed as infection from foreign yeasts, moulds and bacteria lurks everywhere.
- In addition to these cultures, you should also use a good starter culture or souring agent.
- With the exception of cheeses that are prepared with propionic acid bacteria and that need to be stored in a warm place, cheeses prepared with the other three cultures, need to be stored in a cool place with high humidity. You could use an old fridge with a bowl of water in it for this.

Cheeses ripened with mould and/or culture.

These cheeses owe their flavour, smell and appearance to the production of a special mould, or bacteria culture on the rind, inside the cheese or both.

Most of the cheeses produced using this type of culture belong to the so-called soft cheeses.

The following basic processes are used in their manufacture:

1. pasteurising the milk beforehand
2. souring the milk
3. adding culture or not depending on the cheese
4. curdling the milk
5. chopping the curd coarsely
6. warming up the whey-curd mass
7. ladling the whey-curd mass in the moulds to drain
8. salting the cheese or immersing in brine
9. depending on the type of cheese, applying culture to the rind
10. ripening the cheese

Souring the milk

In addition to adding the mould or bacteria culture, you should also add a good starter culture. If the normal amount used is 1% (with some soft cheeses this is a bit higher) or less, the milk will take a longer time to sour (the process before the rennet is added). The bacteria need this time to form lactic acid, which is what sours the milk.

Adding the culture

Here is a short description of the cultures that you may add (or not add) and how to go about this.

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**Curdling the milk**

Only a small quantity of rennet needs to be used. Generally, this should be one to five drops per litre of milk. All depends on the curdling temperature of the milk and the time needed for the cheese to sour.

Cutting the curd

The curd is usually chopped roughly, sometimes the curd is ladled directly into moulds.

Warming the curd

The temperature is usually kept rather low, around 32°C. In some recipes this process is not included at all.

Putting into moulds and draining

A large number of cheeses have their own traditional cheese moulds with specific shapes and dimensions.

The moulds, which are filled with curd, are placed on a plastic cheesecloth so that the whey can drain away. The moulds are filled to the top with curd. And the whey drains straight off. The moulds can be topped up with curd later.

Certain cheeses do not require pressing; a certain amount of the whey is pressed out by the weight of the curd itself. We recommend turning the cheeses in their moulds several times during the draining process. This will ensure that the cheeses have a better shape, as the curd in the moulds usually sink in the middle.

Cheeses should normally be left to drain for one to three days.

Salting the cheese

The cheeses can be salted in three different ways depending on your preference or the type of cheese being prepared and these are as follows:

1. You can rub salt into the cheese or apply a solution of salt water.
2. You can add salt to the curd.
3. You can immerse the cheese in brine.

Once the cheese has been sufficiently drained and has taken on the right shape, it should be removed from its mould and immersed in brine or salted.

The salt helps combat undesirable organisms, but will not slow down the growth of the mould.

A) *Bacterium linens*

Linens culture that is grown in pure culture is used for all types of "washed" red rind cheeses such as Tilsiter, Münster, Romadur, Pont-l'Évêque, Limburgse kaas and Kernhemse.

It is this culture that gives cheese its typical odour and these particular cheeses have this culture to thank for their smooth orange/red or red/brown rind.

The culture turns the rind alkaline, and because the rind is washed regularly, there is little chance of mould forming on it.

Adding linens culture to milk is not recommended. Growth is slowed down by the presence of the starter culture. So, it is better to add the diluted culture to the rind, distributing it evenly. We also recommend adding a small quantity of the culture to the "washing" solution.

"Washing" solution

The linens bacterium needs humid conditions if it is to do its work effectively. A handy way of spraying the cheese is to use a plant sprayer. Later in these guidelines we tell you how to prepare the "washing" solution.

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**Ripening and storing**

Ideal conditions for the ripening and storing are a temperature of between 14 and 16°C and a relative humidity of 90%. If the humidity is too low, then you run the risk of the cheese drying out; the rind will form too quickly and the development of the "washed" rind will slow down and may even stop completely. A "washed" rind process that is too powerful is not recommended as it will produce an uneven ripening and this will produce a flavour that is not pure. If the "washed" rind is too strong, you can rub the rind off or scrape it off and use a weaker mix of "washing" solution. Spraying the rind and smoothing it on by hand gives you a good control over the rind formation.

Storing cultures

Linens culture can be kept for six months at a temperature of -20°C (and for three months at +5°C) without losing any of its strength.

Dosing and usage

Dissolve one bag in 200 ml of 3% salt solution. This solution must be boiled before adding the culture – and then cooled down to 20°C. It can then be kept for a week in the fridge.

Washed Rind Cheeses

Some of the above-mentioned fresh red rind bacteria solution (*Bacterium linens*) should be added to the "washing" solution each day.

Buttermilk Cheeses

We recommend adding this culture to the curd for these cheeses.

Dosing: a solution made with one pack of culture for 50 kilos of curd.

When using the linens culture, you can forget the housecleaning a bit. With these cheeses you don't need to wash the cheesecloths as this is where the bacteria live.

People who do not like these kinds of cheeses are often put off by the smell.

B) *Penicillium roqueforti*

This mould culture is used in the preparation of Gorgonzola, Roquefort, Stilton and Danish Blue for instance as well as any cheeses that are ripened by mould both inside and on the outside of the cheese.

The following characteristics make this culture particularly suitable for cheesemaking :

1. Good mould growth in an acid environment
2. Supports a relatively high concentration of salt, i.e. no noticeable slowdown in growth when using 5% cooking salt and even with 10% there is still growth.
3. Good mould growth in a low acid, high carbon dioxide environment.
4. Produces enzymes that ensure breakdown of fat and proteins, which give the above-mentioned cheeses their characteristic flavour and unmistakable smell.
5. Guaranteed even ripening of the cheese and good mould growth inside the cheese.
6. Rapid ripening and an end-product with consistent and high quality.

Dosing and usage

The content of one packet is sufficient for 500 litres of milk.

The culture must be dissolved in about 20 ml of sterile (boiled) water 10 to 23 hours before use. It re-absorbs the moisture that it has lost during the freeze-drying process.

This solution must be added to the milk before the curdling process and because it is important that the spores are well mixed into the milk, it should be well stirred.

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**Storing the culture**

Freeze-dried cultures will keep for six months at a temperature of 4-8°C. Culture solutions will keep for one week in the fridge.

Ripening and storing

Real Roquefort cheese is made from ewe's milk that is at least 24 hours old. In order to bring out the blue/green mould in the cheese, a sharp utensil is inserted randomly to create channels through the cheese.

The mould spores need air in order to develop.

This cheese needs a cool environment - preferably 8-9°C and humidity approaching 95%.

C) *Bacterium propioni*

Propionic acid bacteria play an important role in the ripening of different types of hard cheeses such as Emmentaler, Gruyère and Maasdammer.

It converts the lactic acid during the ripening process. This creates propionic acid bacteria which create the typical flavour of these cheeses. The carbon dioxide produced during the fermentation is what produces the large holes in the cheese.

Although propionic acid bacteria occur in nature, we normally need to use a culture that has been grown in a laboratory in order to obtain the large holes in cheese.

Propionic acid bacteria start to die off at a temperature of 56° C.

The culture should be added directly to the milk. If the same culture is added at a later stage you will not get good results.

How to obtain cheese with holes

1. make sure you have a higher pH (5.2 to 5.4), in other words you need an unsoured cheese
2. add lots of water to the curd mass and do not finish processing until well-dried
3. do not salt the curd
4. do not use any saltpetre
5. store the cheese at a warm temperature for several weeks after the brine process (approx. 23° C)
6. cheese should be immersed in brine for the shortest possible time

If you do the opposite, raising your pH rapidly to 5.2, adding little or no water, using saltpetre, salting the curd and leave the cheese for a good time in the brine bath, you will slow down the formation of gases.

Dosing and use

One packet of freeze-dried culture is sufficient for 500 litres of milk. We recommend mixing the content with a little milk and just before curdling occurs, mix it in with the milk for the cheese. Stir it well to make sure the culture is well mixed into the milk. The amount you use will depend on the type of cheese you are making. It is essential of course to use a good starter culture as well as the propionic acid bacteria.

Storing the culture

The culture will maintain its strength for six months if kept at 4°C. The culture should be used immediately after opening the packet. This is because it attracts moisture and rapidly loses its strength.

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**Diluting the culture**

Propionic acid bacteria can be dissolved in sterile, (boiled) tap water. Dissolve one packet in 200 ml of water. This solution will keep for two to three days in the fridge.

Cheese made using this culture has a sweet-aromatic flavour, slightly nutty.

You can use the same recipe as for Gouda. We recommend finishing the cheese "dry", in other words not letting the temperature drop too low and processing the curd thoroughly.

D) *Penicillium candidum*

Penicillium candidum or *Penicillium camemberti* are the scientific names for what is commonly called white Camembert mould.

Pure cultures are used to make cheeses with white moulds such as Brie, Camembert, buttermilk cheeses and cheeses with mould growth on the inside as well as the outside of the cheese.

Culture plays an important and defining role in the manufacture of these kinds of cheeses.

1. it gives the product its characteristic appearance: the even white bloom.
2. under normal circumstances it hinders the growth of other unwanted moulds such as *Mucor*, or green mould.
3. the presence of enzymes, that ensure further breakdown of fats and proteins, affect the length of the ripening process and consequently the creation of the particular smell and consistency of the cheese.
4. because it is able to break down the lactic acid, it neutralises the cheese (thus making it less sour) because it promotes the development of the positive proteolytic bacteria such as *linens* bacteria for instance.

This culture, recommended for the manufacture of Camembert and Brie, grows best under the following conditions:

- kept for a maximum of three days in the drying room at a temperature of 18°C on the first day, going down to 17°C on the last day, with a relative humidity of around 80%.
- then kept for eight to twelve days in the ripening room where the recommended humidity is 90 to 95% on the first day and the temperature 16°C decreasing gradually to 12°C.
- one to two days before packing, the temperature should be reduced to 8°C so that the ripening process slows down and the cheese takes on a firmer consistency.
- Storing cheeses in an environment with high humidity levels increases the risk of foreign and unwanted moulds forming.

Storing the culture

Freeze-dried cultures will keep for six months at a temperature of 4°C without any loss of strength.

Dosing and usage

We recommend dissolving the culture 24 hours beforehand in 200 ml of sterile (boiled and cooled) water. Keep this solution in the fridge. It will keep for a week. This ensures that the mould will develop rapidly.

***Penicillium candidum* can be used in three different ways:**

Add to the milk before the curdling process. One packet is sufficient for 500 litres of milk.

Spray (with a plant sprayer) or sprinkle onto the surface of the cheese. One packet of culture applied in this way will suffice for 60 kilos of cheese. The culture solution must be diluted in 20 to 40 times its volume of sterile water.

Rub a salt solution into the cheese.

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**White mold cheese**

Camembert originates from the town in France of the same name. It was discovered in 1791 by Marie Fontaine and became one of the world's most prized cheeses.

It is a cheese that ripens mainly from the outside in with the help of mould.

The Latin name for this mould is *Penicillium candidum* or *Penicillium camemberti*.

This mould gives the cheese its strong flavour and is what creates the ripening process. This process is so effective that the cheese ends up becoming runny and liquid.

Camembert is not very easy to make because of the conditions required during draining and storage. The cheese must be kept in the drying room for a maximum of three days at a temperature during the first day of 18°C reducing gradually to 17°C on the last day and with a relative humidity of around 80%. The cheese should then be kept for eight to twelve days in the ripening room where the recommended humidity levels should be between 90 and 95% and where the temperature should reach 16°C on the first day and be gradually decreased to 12°C. One to two days before packing, the temperature should be decreased to 8°C so that the ripening procedure is slowed down and so that the cheese can take on a firmer consistency.

Camembert can be made from cow's milk or goat's milk.

Two litres of milk will make sufficient curds for one standard Camembert mould. A Camembert mould is a topless and bottomless 11 cm diameter and 11 cm high cylinder. Two litres of milk will make almost one kilo of cheese.

Preparation

Bring two litres of milk up to 32°C and add 50 ml of starter culture. Mix this in well and leave to sour for one and a half hours. Add six drops of rennet and mix this carefully into the milk. Leave for one hour. The milk will now have coagulated sufficiently and the curd should make a smooth break.

You should now break up the curd into pieces of around 1 cm. The curd should now be stirred very, very carefully for a quarter of an hour, taking great care not to damage the structure.

After stirring, leave the whey/curd to stand for a quarter of an hour. The curd will sink to the bottom and you should remove the whey to just above the level of the curd. The best way to fill the mould is to take a piece of dry cheesecloth and place the mould on top of it. Then ladle the curd carefully into it. After it has drained for an hour, turn it over onto another piece of cheesecloth. You should take great care here not to damage the rind. The cheese should be turned every hour during the draining process. The total draining time is 24 hours.

The final cheese should be 3 to 4 cms thick.

You should now rub salt into the total surface of the cheese. Add the mould culture the following day.

There are three ways of doing this (see heading: "*Penicillium candidum*").

A few more tips:

1. You can package these cheeses in cellophane, but never in plastic.
2. Around six weeks after packing, the cheese will go runny, so it needs to be eaten within those six weeks, this ripening process will depend very much on the storage temperature.

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