Improve your cream cheese production with flexible Nutrilac® solutions
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Cream cheese and functional milk proteins are a perfect match

The texture and quality of cream cheese are highly dependent on milk protein content, which can range from 5 to 14%. Cream cheese is therefore a perfect candidate to apply unique Nutrilac® functional milk protein solutions. They can help you in optimising your cream cheese products and production processes.

Cream cheese is a popular cheese product, it is produced in many different ways and consumption is increasing globally. It is fresh tasting and creamy, and can be used as a table spread, an ingredient for cooking, or as filling in cheesecakes etc.

Cream cheese products appear in the market in different variants and with fat content ranging from 0% to 35%.

Advantages of using Nutrilac®
The main advantages of our Nutrilac® solutions in cream cheese are:

- High water binding capacity
- Creamy mouth-feel
- 100% milk based ingredients (clean label)
- Fat substitution

Benefits of using Nutrilac®

- Increased flexibility in cream cheese production
- Improved existing product texture and usability
- Maximum utilisation of milk ingredients
- Reduction/elimination of acid whey
**Traditional cream cheese production**

**Production by UF/separatore**

The most common production method of cream cheese involves concentrating a fermented milk and cream mass to the desired dry matter and texture, by separator or ultra filtration. Heat treatment is then performed on the concentrate prior to homogenisation, possible flavour addition and filling. This production method has the following identifiable consequences:

- Low yield output per kg raw material, e.g.:
  - Starting ingredients per kg cream cheese
    - 2.4 kg cream = 1 kg full fat cream cheese
    - 6 kg milk = 1 kg low fat cream cheese

- High quantities of acid whey are produced as a by-product

- Long list of equipment is needed (Silo tanks, PHE’s, UF/Separator, SSHE, homogeniser, etc.)

**Other production methods**

Cream cheese can also be produced by:

- concentrating a fermented cream mass in cloth bags
- processing a mix of skimmed milk quark, butter and milk proteins
- making partly or fully recombined formulations based on water, milk fat or vegetable oil and milk proteins
Potential challenges of producing cream cheese

There are a number of commonly recognised challenges to producing quality and cost efficient cream cheese.

These challenges are as follows:
- Decreasing acid whey volumes
- Decreasing syneresis
- Increasing creaminess
- Replacing and simulating fat in low fat cream cheese
- Improving bake stability

Decreasing acid whey volumes

For each kg of cream cheese that is produced, there is typically 2-4 kg of acid whey left as a by-product. This acid whey is of low value, and is normally used as animal feed; often with an economical loss for the producer. The reduction of acid whey is also encouraged because of the global focus on environmental protection.

Arla Foods Ingredient’s Nutrilac® for cream cheese solutions are based on innovative processes and formulations that can reduce, or fully remove acid whey from cream cheese production.

Decreasing syneresis

A major challenge with cream cheese production is avoiding syneresis, which is often present in cream cheese products.
Syneresis is a natural occurrence on the surface of cream cheese, but for most producers it is something they want to reduce as much as possible. By exploring the high water binding capacity of our Nutrilac® functional milk proteins, the syneresis can be significantly reduced in a natural way!

**Increasing the creaminess**

Cream cheese is recognised as being very creamy and enjoyable to eat, whether it is on top of bread, as a dip, or as the filling in a cheesecake.

Our Nutrilac® Functional milk protein solutions should be considered if you want to increase the creamy sensation in your cream cheeses. Our Nutrilac® solutions are able to boost the creaminess significantly at all fat levels.

**Fat replacement in cream cheese products**

Fat has an important role in the texture of cream cheese. Fat contributes to the fresh dairy taste, but primarily it makes the cream cheese smooth and creamy. When the fat level is reduced to below 10% total fat, there is often more protein than fat in the end product, and this changes the texture from smooth and creamy to dry.

In the case of low fat cream cheese, it is therefore of major interest to find ingredients that are able to compensate for the lower fat content.

Once again, Nutrilac® functional milk protein solutions offer a perfect solution to the low fat challenge. Arla Foods Ingredients has high expertise in protein solutions with excellent properties as fat mimetics in cream cheese products.
Improving the bake stability

Cream cheese is a popular filling for different baked goods (cakes, pastry etc.), but the best known application is in cheesecakes.

Cheesecakes often contain a filling consisting of cream cheese, flour, sugar, eggs etc., which are baked before cooling and packaging. During the baking process the temperature of the cream cheese filling exceeds 100°C, which often makes the cream cheese bubble, and become thin and runny.

These problems are often dealt with by adding starches and gums to the cream cheese. However, these must be labelled, giving the end product a more unnatural appearance and content.

Arla Foods Ingredients offer solutions where the functional milk proteins are able to bind the water so tightly in the cream cheese microstructure, that it will not start bubbling when baked.

AFI Solutions for cream cheese

By utilising the functionality of our Nutrilac® milk protein solutions, we can help solve the challenges of cream cheese producers. The main areas of cream cheese production where our solutions can be applied are:

- Stabilisation of quark based formulations
- Wheyless formulations
- Improved bake stability
- Fat replacement in low fat cream cheese
- Improved water binding and product stability

Stabilisation of quark based formulations

Some manufacturers produce cream cheese products by processing quark, butter, milk proteins and additional gums or starches in a batch cooker, followed by homogenisation at 100-200 bar.

Milk proteins are essential in such formulations in order to create the desired shear resistance, mouthfeel, creaminess and stability. However, the results can differ greatly depending on the type and quality of the quark, which is by far the biggest ingredient in this type of cream cheese.

For example “thermo quark” is often challenging to work with, as it has a tendency to create mealy/grainy products. The fresher the quark is the better the results will generally be.

Quark based cream cheese products can be based on

- Skimmed milk quark
- Butter, cream or vegetable oils
- Bulk cream cheese with high dry matter
- Functional milk proteins
- Additional stabilisers
Wheyless formulations
One of Arla Foods Ingredients’ key competences is to develop high quality fully/partly recombined dairy products, including cream cheese.

The production of wheyless cream cheese products can be based on
- Water or skinned milk
- Butter, cream or vegetable oils
- Functional milk proteins
- Mesophilic culture or food grade acid

There is good sense in considering a wheyless production system from AFI for high quality cream cheese products.

Cream cheese is first of all a very milk consuming product category, where you as a producer now have the possibility to utilise your total milk volume in a better way.
Consequently the handling cost of the raw milk is significantly reduced per kg final cheese!
The use of milk is reduced by up to 70%, when converting from traditional production to an AFI system.

Less milk, more cheese!

A wheyless system produces no acid whey or permeate, which day by day becomes more and more interesting for you as a producer! When eliminating this from your production line, you use less energy, less silotanks, and less chemicals for cleaning.

All together a reduction in milk usage of 70%, and 100% elimination of acid whey, makes you able to save both money, but significantly to cut down on your CO₂ emmision!
On top of these huge advantages, the process to be used, is more simple and less equiment is required for an AFI wheyless system, compared to a traditional setup with ultrafiltration or separator.

Fermented wheyless cream cheese – hot filled

<table>
<thead>
<tr>
<th>Ingredients</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Nutrilac® CH-5559</td>
<td>7.5 %</td>
</tr>
<tr>
<td>Cream, 38% fat</td>
<td>39.0 %</td>
</tr>
<tr>
<td>Milk, skimmed</td>
<td>41.0 %</td>
</tr>
<tr>
<td>Butter, unsalted</td>
<td>12.0 %</td>
</tr>
<tr>
<td>Salt (NaCl)</td>
<td>0.5 %</td>
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</table>

<table>
<thead>
<tr>
<th>Nutritive values</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>6.4 %</td>
</tr>
<tr>
<td>Fat</td>
<td>24.9 %</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>5.7 %</td>
</tr>
<tr>
<td>Total Solids</td>
<td>38.6 %</td>
</tr>
<tr>
<td>Fat In Dry Matter</td>
<td>64.7 %</td>
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</table>

<table>
<thead>
<tr>
<th>Process</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Blend ingredients</td>
<td>45°C, high speed mixing</td>
</tr>
<tr>
<td>Hydrate mix</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Preheat mix</td>
<td>65°C</td>
</tr>
<tr>
<td>Homogenisation</td>
<td>100 bar</td>
</tr>
<tr>
<td>Pasteurisation</td>
<td>95°C, 5 minutes</td>
</tr>
<tr>
<td>Cooling</td>
<td>to 27°C</td>
</tr>
<tr>
<td>Add mesophilic culture</td>
<td></td>
</tr>
<tr>
<td>Fill into fermentation tank</td>
<td></td>
</tr>
<tr>
<td>Incubation</td>
<td>at 27°C, until pH 4.8</td>
</tr>
<tr>
<td>Pasteurisation</td>
<td>75°C, 30 seconds</td>
</tr>
<tr>
<td>Homogenisation</td>
<td>100 bar</td>
</tr>
<tr>
<td>Filling</td>
<td></td>
</tr>
<tr>
<td>Cooling</td>
<td>to 5°C</td>
</tr>
</tbody>
</table>
**Wheyless formulations – fermented by culture**

Wheyless system cream cheese is fermented by a mesophilic lactic acid culture, which brings a fresh and aromatic taste to the cream cheese.

These formulations are typically based on ingredients such as skimmed milk, cream and functional milk proteins, and they are divided into the categories of hot filled and cold filled cream cheese, respectively.

**Hot filled cream cheese**

The pasteurisation of the milk and protein mixture is performed on a Plate Heat Exchanger (PHE), and any heat treatment is done using a Scraped Surface Heat Exchanger (SSHE) or Tubular Heat Exchanger (THE) after fermentation.

By applying heat treatment to the fermented mass, the cream cheese is defined as “hot filled”, with a shelf life of 3 to 6 months.

**Advantages of the hot filled process**

- No acid whey from production
- Limited use of milk as raw material
- Aromatic flavour
- Long shelf life

**Cold filled cream cheese**

The heat treatment can also be left out; resulting in a cream cheese defined as “cold filled”, with a shelf life of 3-5 weeks cool stored.

We have two methods available for the production of cold filled cream cheese:

1. **Cold filled cream cheese process:**
   achieved by mixing a fermented white mass with salt, filling it into the desired packaging, followed by cooling. This production method can be implemented on a stirred yoghurt line.

2. **Innovative AFI direct set cream cheese process:**
   achieved by adding salt at the same time as the culture, and the fermentation then takes place in the packaging. This production method can be implemented on a set yoghurt line.

**Advantages of the cold filled processes**

- No acid whey from production
- Simple process
- Very creamy and fresh tasting results
Wheyless production of cream cheese using functional milk proteins fermented with culture

- **MIXING OF INGREDIENTS AT 5°C-50°C**
- **HYDRATION FOR 30 MINUTES**
- **PREHEATING TO 65°C ON PHE**
- **HOMOGENISATION AT 50-200 BAR**
- **PASTEURISATION AT 92°C ON PHE FOR 5 MINUTES**
- **COOLING TO FERMENTATION TEMPERATURE**
- **ADDITION OF MESOPHILIC LACTIC ACID CULTURE**

**Filling into Silo Tank**
- **Filling into Beakers or Buckets**
- **Filling in Beakers or Buckets**
- **Cold Filled Cream Cheese (Shelf Life 3-5 Weeks)**

**Add Salt**
- **Add Salt & Additional Stabilisers**
- **Heating to 70-75°C on SSHE/THG for 1-3 Minutes**
- **Filling in Beakers or Buckets**
- **Cooling**
- **Direct Set Cream Cheese (Shelf Life 3-5 Weeks)**

**Breaking of Curd by Agitation**
- **Adjustment of pH 4.8**
- **Heating in Air Tunnel**
- **Cooling**
- **Hot Filled Cream Cheese (Shelf Life 3-6 Months)**
**Wheyless formulations – quick processing by GDL**

The processing involves a mixing step, pasteurisation and homogenisation, and can be performed as a batch production, by using a cooker like Stephan, Scanima etc., and a homogeniser.

It is also possible to make the production continuously by combining 1 to 3 mixer tanks with a scraped surface heat exchanger and a homogeniser.

The acidification can be performed either by means of foodgrade acid; GDL (Glucone-Delta-Lactone), lactic, or citric acid.

**Advantages of the quick process**
- Production time reduced to 20 minutes
- No acid whey
- Simple production method
- Fresh and creamy end result
Improved bake stability

This solution from our well-known Nutrilac® range, is an efficient substitute for the gums and starches typically used to secure an optimum baking performance in cream cheese used for cheesecakes, stuffed fillings and other products for the ready meal market.

Arla Foods Ingredients has developed the solution in line with our optimised wheyless cream cheese process, which enables a production time of just 20 minutes.

We have delivered the solution based on requests from a number of markets, where retailers focus increasingly on food products with cleaner labels. Our Nutrilac® milk protein solution is a closer-to-nature ingredient for addition, along with cream, butter or vegetable oils for fast cream cheese production using only a batch cooker and homogeniser.

Like traditional stabilisers, the Nutrilac® solution provides the key water binding functionality that bake stable cream cheese requires. This includes the ability to tolerate temperatures in excess of 100°C without bubbling and turning runny.

### Bake stable cream cheese

**Ingredients**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrilac® CH-7694</td>
<td>10.70 %</td>
</tr>
<tr>
<td>Skimmed milk powder</td>
<td>5.00 %</td>
</tr>
<tr>
<td>GDL (Glucone–Delta–Lactone)</td>
<td>1.20 %</td>
</tr>
<tr>
<td>Citric acid</td>
<td>0.10 %</td>
</tr>
<tr>
<td>Salt (NaCl)</td>
<td>0.65 %</td>
</tr>
<tr>
<td>Butter, unsalted</td>
<td>33.75 %</td>
</tr>
<tr>
<td>Water, tap</td>
<td>40.60 %</td>
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<tr>
<td>Water, condensate</td>
<td>8.00 %</td>
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**Nutritive values**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Protein</td>
<td>10.2 %</td>
</tr>
<tr>
<td>Fat</td>
<td>28.4 %</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>3.6 %</td>
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<tr>
<td>Total Solids</td>
<td>45.0 %</td>
</tr>
<tr>
<td>Fat In Dry Matter</td>
<td>63.2 %</td>
</tr>
</tbody>
</table>

**Process**

- Add to batch cooker, butter and water, 45°C, 1500 r.p.m.
- Indirect heating, 50°C, 1500 r.p.m.
- Add rest of dry ingredients, mixing 5 min., 1500 r.p.m.
- Indirect heating, 30 seconds
- Direct heating to 92°C, 1500 r.p.m.
- Pasteurisation 92°C, 5 min., 1500 r.p.m.
- Homogenisation 200 bar
- Hot filling
- Cooling to 5°C
Fat replacement in low fat cream cheese
The combination of fat substitution properties and heat resistance from our Nutrilac® functional milk proteins, makes it possible to improve the creaminess in hot filled low fat cream cheese.

Our formulations include the mixing of functional milk proteins into fresh UF-retentate/quark base prior to the pasteurisation step. This has a very positive influence on the final structure and quality of low fat cream cheese, as well as the characteristics of pasteurised low fat cream cheese; Dryness, graininess, syneresis and a typical sharp taste is much less apparent. The smoothness of the cream cheeses produced using these methods are especially good.

We also offer wheyless formulations for producing high quality low fat cream cheese, that should be fermented with mesophilic cultures and heat treated on either a batch cooker, SSHE or THE, followed by homogenisation and hot filling.

Improved water binding and product stability
Cream cheese holds from 52% to more than 70% water, depending on the fat content. It is essential that the water is bound to the cheese matrix in a way that does not result in instability, often seen as syneresis or a thin consistency.

As cream cheese traditionally is a fermented product, small amounts of syneresis are perceived as normal in the eyes of many consumers. However, it is a clear goal of producers to reduce the degree of syneresis as much as possible.

Our Nutrilac® solutions include whey proteins with higher water binding efficiency than the average milk proteins found in cream cheeses. Using our methods to mix Nutrilac® milk proteins into any cream cheese mass, the cheese matrix can be optimised and thereby syneresis can be reduced.
Recommended Nutrilac® solutions for cream cheese production

<table>
<thead>
<tr>
<th>Nutrilac® solution</th>
<th>Quark based</th>
<th>Wheyless system (fermented)</th>
<th>Wheyless system (GDL)</th>
<th>Bake stable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrilac® CH-4560</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrilac® CH-5559</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Nutrilac® QU-7560</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrilac® CH-7694</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Frequently asked questions

Is it possible to produce cream cheese using the described methods without a homogeniser?
In all our concepts homogenisers are used, as the emulsification of fat, protein and water phase is essential for the structure build up in cream cheese products. With some of our concepts acceptable results can be achieved by applying high shear rates for a period of 2 to 5 minutes.

Is it possible to produce cream cheese without E-numbers?
Yes, most of our formulations are fully stabilised by the functional milk proteins, and further stabilisers are then unnecessary.

Is it possible to use cottage cheese, ricotta, or direct fermented quark as ingredients for cream cheese?
Yes, we have the experience and expertise to use these ingredients in formulations; in line with the described “quark-based” formulations.

What are the optimal storage conditions for Nutrilac® functional milk proteins?
AFI’s Nutrilac® solutions are stable when stored at ambient temperature. The product has a minimum one year storage life if kept under the prescribed storage conditions. A cooler storage temperature will give an even longer shelf life.
Arla Foods Ingredients

Bulletin

www.arlafoodsingredients.com

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