



... A WAY TO OPTIMISE YOUR PRODUCT AND PROCESS

OPTI STRAIN™ CONCEPT



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Consultancy

During the cheese making process we are often confronted with deviations, which are related to taste, texture or ripening. For example, the formation of bitterness in ripened cheese, deviations in consistency in low fat cheese or less flavour development during ripening. For solving these problems CSK provides support in optimising production process and are experts at selecting and implementing ingredients. Our consultants share their knowledge to assist dairy companies on improving the taste and texture of their products. Thorough theoretical knowledge is combined with hands on approach to achieve rapid results. With operational excellence being the focus within dairy companies, our consultants try to contribute in actual problem solving on site.



Figure 1. Sensory evaluation at the R&D department of CSK

Proposition Opti Strain™ concept

CSK has developed a specific range of cultures, which positively contributes to an improved end result of the production process of cheese. In the Opti Strain™ concept, cultures are selected which among other are able to prevent bitterness, improve texture, improve gas formation or accelerate ripening. Opti Strain™ cultures can be used to improve not only the taste and texture profile of high quality cheeses, but also of healthy positioned cheese, which suffer from taste and texture deviations due to fat or salt reduction. Furthermore, Opti Strain™ cultures can be very effective to reduce the ripening period without negatively affecting the organoleptic profile.

Benefits Opti Strain™ cultures

Following examples give an impression of the broadness of advantages of the Opti Strain™ cultures:

- improved phage stability in semi hard cheese;
- softer texture in white brined cheese;
- more smooth mouth feel in fresh cheese;
- more flavour in semi hard cheese after shorter ripening period;
- improved eye formation in semi hard cheese;
- less bitterness in natural and foil ripened cheese.

Flavour and texture development in cheese

Many biochemical processes take place during the ripening of cheese which are essential for flavour and texture formation. Soluble proteins released from casein by the action of chymosin and plasmin are degraded by lactic acid bacteria (LAB). With a complex set of proteolytic, peptidolytic and other enzymes LAB are able to degrade the released proteins in several steps into various flavours. Besides protein degradation also fat and sugar metabolism contributes to the overall organoleptic profile (see figure 2).

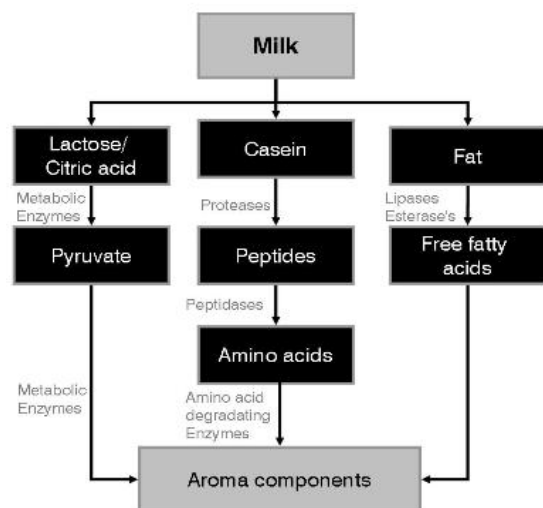


Figure 2. Flavour formation in cheese

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Development of debittering cultures

Lysis of lactic acid bacteria plays a crucial role during proteolysis in cheese. Bacterial lysis ensures the involvement of intracellular starter enzymes in the formation of cheese flavour. In figure 3 the release of proteolytic enzymes is schematically shown. The lack of lysis during cheese ripening can result in an accumulation of degradation products of casein in the cheese matrix. This unbalanced proteolytic system, caused by faster formation than degradation of bitter peptides, results in the taste deviation bitter. To avoid this, the suitability of lysis sensitive strains as debittering cultures have been evaluated.

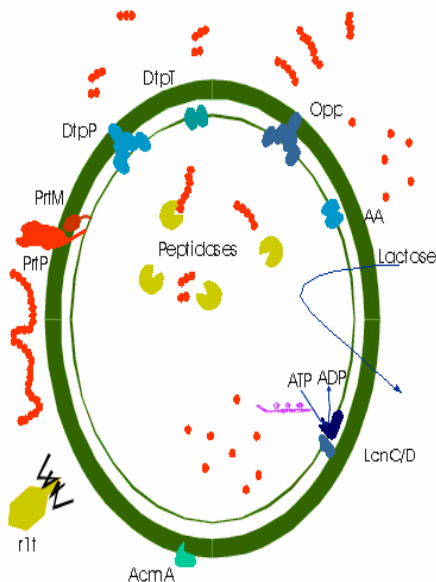


Figure 3. Release of proteolytic enzymes

In extensive laboratory tests the degradation of a bitter substrate, the C-terminal part of β -casein, has been determined. By incubation of selected lactococci with this bitter substrate an indication of the debittering capacity of such strains could be given. Strains with a high degradation rate of the bitter C-peptide, were strains with a high sensitivity to lysis and therefore very suitable as debittering culture.

The selected strains of mesophilic lactococci and thermophilic lactobacilli with the special ability of reducing bitter-tasting peptides have been organoleptically evaluated in Gouda cheese subsequently. In figure 4. the results of the taste deviation bitter in the sensory evaluation is shown.

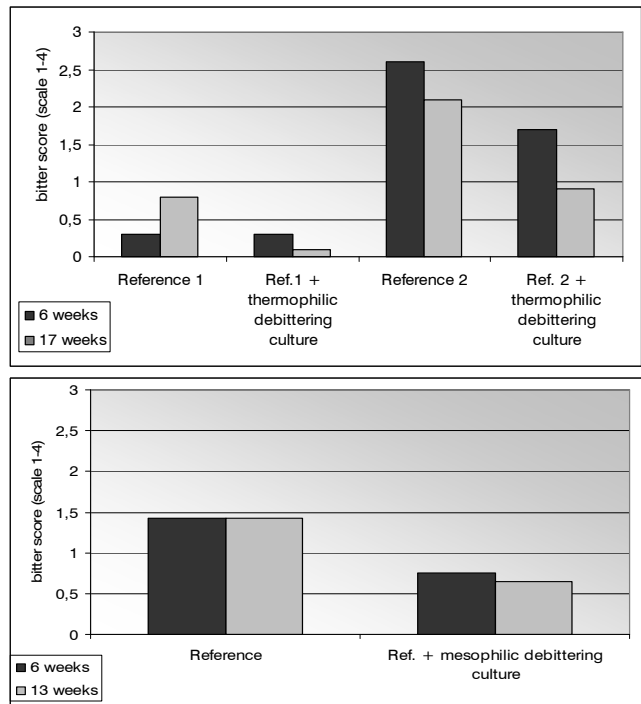


Figure 4 Organoleptic evaluation of Gouda cheese with addition of a mesophilic and thermophilic debittering culture

Other causes of bitterness are the amount of rennet, pH of cheese milk, cooking temperature and ripening temperature. CSK has gained much experience in the reduction of bitterness with use of the Opti Strain™ range in cheese types like naturally ripened and foil ripened Gouda, Cheddar and Maasdam.

Acceleration of ripening

During the ripening of the cheese the organoleptic quality of the cheese is developed. Since cheese ripening involves large expenses in the handling and storage of cheese, acceleration of the ripening process that does not influence the quality of the cheese is of great economic importance. To be able to control cheese ripening, strains with different levels of enzyme activities have been selected. Strains which possess relative high proteolytic activity accelerate ripening. However, these strains may also give rise to bitter taste in cheese during the ripening process. Therefore also strains are selected with high peptidase activity, which can minimise the development of bitter peptides. The Opti Strain™ cultures are able to reduce the ripening time, depending on the type of cheese, storage temperature and desired flavour.

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Stimulation of eye formation

Many cheese types, like Emmental, Maasdam or Gouda cheese, are expected to have a texture with round eyes or irregularly shaped eyes. When eye formation fail to develop under certain conditions, the appearance of the cheese is strongly affected. The gas pressure in the cheese mainly results from CO₂ produced by the starter bacteria and from N₂ dissolved in the cheese. The evolved gas is initially dissolved in the moisture phase of the cheese. When the solution becomes saturated, the gas is released and creates the eyes. Within the Opti Strain™ range, specific strains of *Lactococcus lactis* ssp. *lactis* var. *diacetylactis* (D-culture) are selected, which produce CO₂ through citric acid fermentation. In figure 5 the developed gas pressures of different culture types are shown.

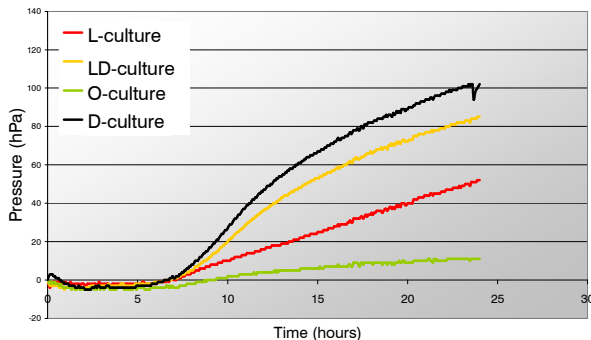


Figure 5. Gas pressure measurements of different culture types

Flavour and texture improvement

As result of ripening acceleration an intensification of flavour has been observed. Not only in naturally ripened or foil ripened full fat Gouda, but also in low fat and low salt Gouda a flavour intensification can be achieved. Furthermore, a more full bodied flavour profile in smeared cheese types and an increase in sweet intensity in Maasdam cheese types can be created with use of Opti Strain™ cultures. Additionally, texture modifications can be created with use of Opti Strain™ cultures. For example more elasticity in low fat cheese, crystal formation in ripened cheese or a softer texture in foil a naturally ripened Gouda cheese types.

Opti Strain™ culture range

The Opti Strain™ culture range consists of a collection of strains which positively contributes to an improved end result of your production process. In the table below the different Opti Strain™ cultures with their functionality are described.

Opti Strain™ range	Functionality
L range Thermophilic cultures	- high prevention of bitterness - high acceleration of ripening - high flavour improvement - medium texture improvement
O range Mesophilic cultures	- medium prevention of bitterness - medium acceleration of ripening - medium flavour improvement
H range Mesophilic cultures	- stimulation of eye formation

Table 1. Characteristics of Opti Strain™ cultures

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Our experts can provide you with further advice on the use of the Opti Strain™ cultures to develop your optimised cheese. In close collaboration they will give the optimal support to improve you existing product range.

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