CHOOZIT™ Cheese Cultures

DANISCO

First you add knowledge...

CHOOZIT™ Cheese Cultures for taste and variety

Introduction

Cheese is a complex food characterised by enormous variety. Textures ranging from hard to spreadable, aromas ranging from pungent to plain, and flavours ranging from intense to insipid distinguish the many different types from each other.

Danisco broad range of cultures gives manufacturers the opportunity to choose exactly the right culture for their particular needs - securing the supreme flexibility that lies behind the brand name: CHOOZIT™ Cheese Cultures.

Cultures for cheese

Cheese making is essentially a means of preserving milk and preventing spoilage and is principally a dehydration process. But many traditional practices and processes create cheeses with a great number of tastes and forms. This, in turn, calls for an extensive variety of cultures used for acidification, ripening and flavouring.

The cheese culture plays three important roles in the process:

- It produces acid, converting the milk sugar lactose into lactic acid
- During the ripening or the maturation stage when all the substrate has been used, the cultures lyse and release enzymes. These enzymes contribute to the breakdown of protein and fat, resulting in textural and flavour development
- Where required, specific cultures are used to produce the eyes or holes associated with specific cheese types

In many cases the acid-producing culture is also responsible for cheese flavour and textural development. However, there are also many cases where an adjunct culture or surface-ripening flora is required.

CHOOZIT™ Cheese Cultures

The CHOOZIT™ range comprises individual culture-building blocks, enabling manufacturers to produce their own customised cheese culture solutions. Primarily acid-producing strains can be selected separately from strains with a flavour and/or textural enhancement role. This gives manufacturers greater choice and control over exactly what is added to the cheese vat.

The CHOOZIT™ range also provides ready-to-use blends for each type of cheese application. Such blends contain various strains that deliver a complete functional solution in one bag.

CHOOZIT™ cultures are all suitable for direct inoculation into the milk vat (DVI) and are available in frozen pellet or freeze-dried form.

CHOOZIT™ Lactic Cultures

CHOOZIT™ *Mesophilic* Acid Cultures

These cultures are generally referred to as O (or homo-fermentative) cultures and comprise the following species:

- *Lactococcus lactis* subsp *lactis*
- *Lactococcus lactis* subsp *cremoris*

Their primary purpose is to convert lactose into lactic acid in the production of many cheese types, including Cheddar, cottage, feta and Dutch. As they do not ferment citrate, they do not produce gas. These cultures are generally defined blends of pure strains.

Danisco also supplies a separate range of mesophilic cultures that convert citrate into diacetyl, which contributes flavour, and CO_2, which is necessary for eye formation. These cultures are generally undefined multi-species cultures composed of O, D and L cultures, although Danisco also supplies defined blends of these strains, including:

- *Lactococcus lactis* subsp *lactis biovar diacetylactis* (D culture)
- *Leuconostoc species* (L culture)

CHOOZIT™ *Thermophilic* Acid Cultures

These cultures are used in the production of cheeses such as mozzarella, emmenthal and stabilised soft cheeses and are generally composed of one or more of the following species:

- *Streptococcus thermophilus*
- *Lactobacillus bulgaricus*
- *Lactobacillus helveticus*

In addition to lactic acid, the *Lactobacillus* cultures produce acetaldehyde and other flavour components and have comparatively well-developed proteolytic enzyme systems.

This means *Lactobacilli* not only contribute to acidification but also promote proteolysis during ripening and influence consistency and flavour formation.

CHOOZIT™ *Thermophilic/Mesophilic* blends

Defined blends of mesophilic and thermophilic strains have been developed for a large category of semi-hard and hard cheeses. The functional properties of these two types of culture promote temperature growth, texture, short lag phase and ripening.

CHOOZIT™ Adjunct Cultures

Certain cultures can be used as an adjunct to add a specific functionality to the final cheese product. These adjunct cultures are a good value-for-money option for manufacturers seeking to increase cheese yield, reduce cheese maturation time or develop cheese with a unique and appealing flavour. Danisco supplies the following:

- Polysaccharide-forming cultures that improve texture and yield in reduced fat and full fat soft and semi-hard cheeses
- Flavour-enhancing cultures that speed up cheese ripening, break down bitter peptides and/or give distinct flavours. The Danisco flavour adjunct range accommodates a broad palette of cheese tastes
- Citrate-fermenting cultures that produce flavour (e.g. diacetyl) and CO_2, contributing to desirable flavour and textural changes in specific cheese types

CHOOZIT™ Ripening Cultures

Brevibacteria

Brevibacterium linens and other *Corynebacteria* are an important component of the so-called red-smear flora, which are commonly used in the production of smeared cheeses such as Munster and Limburger. *Brevibacteria* serve three primary functions:

- Provide the right colour and appearance
- Secure flavour formation
- Protect against contaminating moulds

CHOOZIT™ *Brevibacteria* contribute colours ranging from bright red to creamy orange to neutral. The species used are *Brevibacterium linens, Brevibacterium casei*, and *Arthrobacter sp*.

Yeasts

Yeast, very common in all cheese types, has a number of cheese-ripening functions, including:

- Neutralisation of the cheese surface by assimilating lactic acid

- Stimulation of the desired, acid-sensitive flora (e.g. *Brevibacterium linens*) and inhibition of undesirable bacterial contaminants
- Formation of flavour components through lipolytic and proteolytic activity

CHOOZIT™ yeasts are mainly the *Debaryomyces hansenii* and *Kluyveromyces lactis* species.

Moulds

Moulds grow in the form of a cell unit, the so-called mycelium, and, with the help of enzymes, break down higher molecule compounds into smaller molecules they can exploit. Specific proteolysis and lipolysis of mould cultures result in the formation of characteristic flavours and have a considerable influence on cheese consistency. Mould cultures grow under aerobic conditions, i.e. they require oxygen for their development.
Due to their proteolysis and lipolysis activities, moulds play a very important role during ripening:

- The breakdown of proteins in cheese by proteolysis is especially significant for the texture and organoleptic quality of the cheese. Insufficient proteolysis leads to a hard, crumbly cheese or cheese with a tough texture. Excessive proteolysis results in overly soft cheese, which binds water poorly and often leaves moisture in the package or on the cut of the cheese. Such cheese frequently has a bitter aftertaste
- The breakdown of fat through lipolysis is essential to the development of the typical taste and flavour. The free fatty acids that result are broken down into methyl keytones, which play a major role in the complex of flavour-forming substances in blue mould cheese

Danisco supplies a range of mould cultures, the selection of which should be based on production technology and the desired cheese properties.

Penicillium roqueforti

Penicillium roqueforti has a number of functions in the production of blue mould cheese such as Stilton, Danablu, Gorgonzola and Roquefort:

- Creation of the typical bluish-green mottling
- Prevention of foreign mould growth
- Development of the typical blue cheese taste and creamy consistency of the cheese due to enzymes that develop during its growth

CHOOZIT™ *Penicillium roqueforti* produces colours ranging from pale green to dark blue and has enzymatic activities that produce a very mild to sharp and blue cheese taste.

Penicillium candidum

Penicillium candidum (or *Penicillium camemberti*) is used in the production of white mould cheese such as Camembert and Brie, soft blue cheese with a white ring, goat cheese, and whey (Sauermilch) cheese. It has a number of important functions:

- Creation of the characteristic appearance of white mould cheese
- Protection of the surface from foreign moulds such as mucor and green mould
- Neutralisation of the cheese through its capacity to break down lactic acids, influencing taste and structure considerably
- Contribution to the cheese ripening process by proteolytic and lipolytic properties that produce typical flavour components

CHOOZIT™ *Penicillium candidum* covers all needs, ranging from strains with high enzymatic activity and a strong influence on taste to strains with no activity but which only give a white, thin appearance. Some strains have a specific anti-mucor action.

Geotrichum candidum

Geotrichum candidum is a very common mould in the dairy industry with morphological features that vary from strain to strain, depending on cultivation conditions. There are three morphological types:

- Mould-like strains, forming loose or tomentose (air) mycelium of varying height
- Intermediate types
- Yeast-like strains, forming flat, white, yeast-like colonies

Geotrichum candidum cultures are used both alone and with *P. candidum* in the production of soft cheese such as Brie and Camembert. Due to its proteolytic and lipolytic activity, *Geotrichum candidum* plays a significant role in the ripening process and greatly influences cheese appearance, structure and flavour. In applications such as goat cheese, *Geotrichum candidum* is used alone to cover the surface.
In red-smear cheese, *Geotrichum candidum* helps neutralise the cheese surface and stimulates the development of desirable, acid-sensitive flora such as *Brevibacterium linens*. Working with *Brevibacterium linens*, it produces the red and white surface typical of some European-style cheeses.

Meeting all needs

Complementary to CHOOZIT™, Danisco supplies bulk set starters and cultures media, animal and microbial coagulants, annatto cheese colours, HOLDBAC™ Protective Cultures (against Listeria) and a wide range of enzymes, including Accelase® for a shorter ripening process and Savorase® for the production of enzyme modified cheese. Creative innovation, efficient production and diligent quality assurance ensure the Danisco range of cultures continues to grow.
CHOOZIT™ application support is provided for all types of application by Danisco's global team of cheese experts. Application laboratories assist manufacturers with formulations and applying the CHOOZIT™ range in association with other Danisco cheese ingredients.

A leading supplier

Danisco is the world's largest producer of functional ingredients for food and beverages, with a portfolio that includes antimicrobials, antioxidants, cultures and media, emulsifiers, enzymes, flavours, functional blends, stabilisers, sweeteners and textural ingredients. Thousands of manufacturers in more than a hundred countries use these products every day.

Glossary of terms

DVI - Direct to the Vat Inoculation, for highly concentrated cultures in frozen or freeze-dried form which can be added directly to the milk vat
Bulk set cultures – semi direct culture for liquid starter preparation
Defined single-species culture – a culture composed of single strains of the same species
Defined multi-species culture – a culture composed of single strains of different species
Media – a complex blend of nutrients, which is added to water for the propagation of bulk starter cultures
Mesophilic culture – a culture that grows best at a temperature of 18-32°C
Thermophilic culture – a culture that grows best at a temperature of 37-45°C
Undefined single-species culture – a culture composed of many, uncharacterised strains of the same species
Undefined multi-species culture – a culture composed of many, uncharacterised strains of different species

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Danisco develops and produces functional ingredients primarily for the food and beverage industry and, to a lesser extent, for the non-food industry. Some 9,000 people are employed within the group's sales and production companies and innovation centres in 40 countries. Net sales of DKK 16.4 billion (EUR 2.2 billion) were reported in 2003/04.

Produced mainly from natural raw materials, the broad product range is backed by top technical services, creating innovative, high quality solutions for food and beverage products. The range includes antimicrobials, antioxidants, emulsifiers, enzymes, flavours, functional systems, speciality fats, speciality sweeteners, starter cultures and media, and textural ingredients. Danisco is also one of the largest and most efficient sugar producers in Europe.

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