



FOOD CULTURES

All the answers to your questions

**GOING
FURTHER**





The story of food cultures

Fermented foods: a connection between cultures

Fermented foods exist all over the globe: deli-meats, cheese, yogurts, bread, fish, fermented beverages, cabbage, ketchup...

Over time and through these practices, mankind has promoted the selection of certain cultures.

The term “food cultures” refers to living microorganisms capable of fermentation, such as bacteria, mould or yeast.

Fermentation has allowed certain foods to become digestible. For instance, fermenting olives, a very hard fruit, makes them soft and palatable. The raw, toxic, manioc-root is transformed into an edible food.



Frozen food cultures

Key dates

10.000 BC
First fermented beverages

6.000 BC
First cheese production

Francois the 1st of France is healed thanks to a yoghurt made from sheep's milk prescribed by a Turkish doctor

Work of the French Louis Pasteur on fermentations.



6.500 BC

First beers in China

3.000 BC

The Egyptians invent the first sourdough bread using the silt of the Nile

1542

1600's

First observation of microscopic life by the Dutch scientist Anton van Leeuwenhoek

1800's

Work of the French-naturalized Russian biologist Elie Metchnikoff on yogurt cultures: a hypothesis on the link to the longevity of Bulgarians

1890's



The contribution of scientific knowledge

The 19th century saw a rapid advancement of scientific knowledge and the role of fermentation was understood for the first time thanks to the contribution of European scientists such as the French Louis Pasteur. Fermentation is initiated by living microorganisms. In the beginning of the 20th century, the production of food cultures develops further which allows better control of food manufacturing processes.

In the 21st century, food cultures continue to be a topic of interest. Studies focus on the role of food cultures in the functioning of the intestinal flora (microbiota), control against pathogenic bacteria (ex: *Listeria monocytogenes*) and development of hypoallergenic fermented milk products.

New focus points are emerging for the use of food cultures such as the reduction of food waste and better preservation of food.

It has been discovered that cultures are naturally present on fresh meat and fresh fish, changing our traditional understanding of what is a fermented food. Finally, the use of food cultures is, in essence, a form of domestication and selection of the microorganisms already naturally present in raw foods.

Key dates

France: Marketing of food cultures from the French Pasteur Institute under the brand LabPasteur to milk and cheese manufacturers

1918
1937

1925

First specifications of a Controlled Designation of origin (AOC) cheese in France: Roquefort

Europe: Food cultures not consumed before 1997 must be authorized (novel foods)

1997

Europe: sale of cooked shrimp preserved using food cultures under a protective atmosphere

2000's

Europe: sale of cooked ham using a recipe combining food cultures and vegetable broth

2006

The ABC's of food cultures

Definitions and applications

The mould *Geotrichum*

Bacteria

Consisting of a single cell, bacteria can be shaped like a sphere (shells), rod (bacilli) or spiral. Lactic acid bacteria naturally produce lactic acid, which plays a role in the preservation of food. These include: *Acetobacter pasteurianus* (cocoa), *Carnobacterium* (fish), *Lactobacillus bulgaricus* (yoghurt), *Lactococcus lactis* (French Camembert cheese), *Leuconostoc mesenteroides* (sauerkraut), *Oenococcus oeni* (wine), *Pediococcus* (Nuoc mam), *Streptococcus thermophilus* (yoghurt), *Propionibacterium freudenreichii* (eyes (holes) in Swiss cheese). Certain bacteria are also used for ripening: *Brevibacterium* (Munster crust), *Staphylococcus carnosus* (colour and flavour of salami and cheese).

Cheese ripening

It is the biological process which, thanks to lactic acid bacteria and ripening floras (bacteria, yeasts, and mold), gives cheese their organoleptic qualities (texture, flavor, taste and appearance of the crust). The ripening period varies from a few weeks to a few years. For the French Comte cheese, the ripening is at least 120 days. Crusts may be left dry, brushed or moistened, as for Maroilles, a cheese from the North of France.

Fermentation

Fermentation is a “biochemical reaction which occurs under the action of microorganisms”, according to the French National Institute for Agricultural Research. The food culture develops using a nutritional source in absence or presence of oxygen. The source can be milk, meat, fish, cereals (barley, rice, soy, wheat flour...) or vegetables (grapes, cabbage...). Fermentation modifies and develops the characteristics of a food: its aroma, acidity level, texture, external aspect and microbiological quality.

Fermented milks

Fermented milks are produced from milk of all domesticated animals (cow, sheep, goat, mare, yak, camel...).

Each fermented milk is associated with an added food culture: the bacteria *Lactobacillus bulgaricus* and *Streptococcus thermophilus* in yoghurts, the mould *Geotrichum* in viili, a fermented Scandinavian milk, *Lactococcus* in ribot milk, a combination of lactobacilli and yeast for kefir. These living cultures positively interact with our intestinal flora, also called the microbiota.



Fermented plants

Fermented plants and grains are found in many countries: cabbage: sauerkraut and Kimchi (Korea); Malossol: Russian specialty of pickles fermented in brine; Black tea (China), Kombucha or sweet fermented tea (Asia). Fermented plants and grains are the source of a variety of drinks: wine (grape), cider (apple), pear, sake (rice), beer (barley, buckwheat, wheat, rye, oats...).

Leaven

Leaven is a collection of microorganisms selected for addition to food to be fermented (bread dough, brewery mash, lactic culture for cheese) in order to control the fermentation.

Meat products

Sausages and salami are produced by fermenting meat. The lactic acid bacteria, staphylococci, yeast and moulds used in the process will have an effect on the colour of the sausage as well as the flavour, texture and microbiological quality. Food cultures can also be applied in the production of dried ham or bacon. In cooked “ham” made from pork or poultry, food cultures are used to improve sensory properties as well as to contribute to the reduction of the development of the spoilage flora and/or to inhibit the growth of pathogenic bacteria.

Moulds

Moulds are microscopic fungi. Their diversity is used to give foodstuffs their typical taste or appearance. Examples: moulds of the *Penicillium* genus are responsible for the development of the blue colour in cheese such as Roquefort, the white surface of Brie cheese, and even the homogeneous appearance of the surface of dry salami. Other examples include *Sporendonema casei* responsible for the “golden button” of a Cantal cheese, or *Aspergillus oryzae* (soy sauce).

The yeast can be fresh, dry or liquid





Rakfisk, a Norwegian speciality

Probiotics

The term probiotic means “for life”. Probiotic cultures have documented beneficial effects on human health, such as balancing the intestinal flora (microbiota). Scientists are interested in their beneficial effects e.g. on the immune system, inflammatory diseases of the intestinal tract and in the fight against pathogenic microorganisms. Examples: *Lactobacillus acidophilus*, *Bifidobacterium longum*.

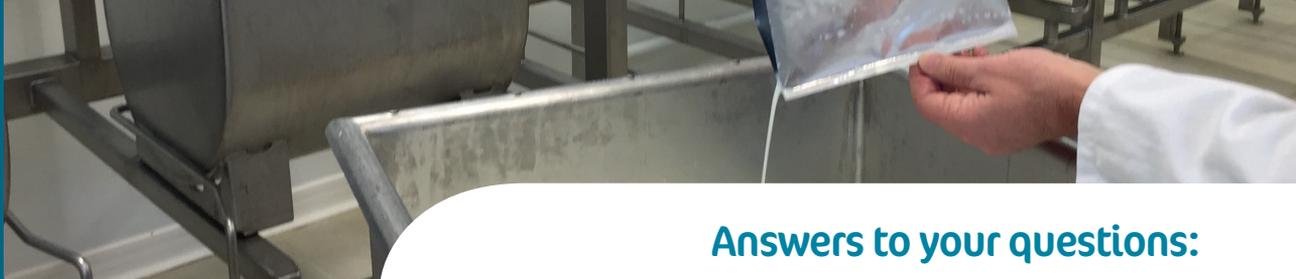
Seafood products

Fermentation is an ancient method of preservation of perishable fresh fish: anchovies, Hakarl (Icelandic specialty made from shark), rakfisk (Norwegian delicacy composed of trout or salted char and fermented), Surströmming (Swedish specialty with a base of fermented herring), Fesikh (Middle East), mayâwah (Gulf countries), momoni (West Africa). Today, the use of food cultures in seafood products provides control of the fermentation, develops characteristic flavor and contributes to the improvement of the microbiological quality throughout the shelf life.

Yeasts

Yeasts are microscopic fungi, spherical or ovoid, composed of a single cell. It is the most widely used family of food cultures in the food sector. Examples: *Geotrichum candidum* (Camembert crust), *Debaryomyces hansenii* (dry sausages), *Saccharomyces bayanus* (champagne), *Candida krusei* (cocoa), *Saccharomyces cerevisiae* (bread, wine and beer).





Inoculation with liquid food cultures

Answers to your questions:

+ Are food cultures safe?

Yes. Like all food ingredients, food cultures must comply with European regulations, the first principle of which is to ensure a high level of safety for the consumers. The rules of hygiene, traceability, microbiological quality must be met by the food cultures manufacturers.

+ Are food cultures identified in the list of ingredients?

Yes. In the EU, food cultures which are added during the food processing are food ingredients. Thereby, they are listed on the list of ingredients. In general, they are labelled either as “cultures” or “microorganisms”, or under a specific name such as “lactic acid bacteria”, or by their Latin name such as “*Bifidobacterium*”, or written in a specific language: “ferments” (French), “Kultur” (German), “cultivo” (Spanish), “cultura” (Italian).

+ Which food cultures can be used in the manufacture of foods and beverages?

The choice of a food culture depends on the characteristics sought, the food matrix and the process of manufacturing. There may also be specific rules of use. For example, in France, a Decree specifies that only two food cultures can be added in the manufacture of yogurt: *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. If other food cultures are used, then the name of the food is no longer “yogurt” but “fermented milk”.

+ How are the food culture strains selected?

The strains come from natural environments: grass, milk, plants, animals, cheese, meat. Scientists study the strain: shape, size, color, and metabolism. The characterisation is determined at the DNA level. The strain is analyzed by scientific methods, particularly to verify that it is safe. Depending on the desired functionality, the strain is selected. One or more strains are mixed to achieve commercialized food cultures according to a controlled process.

+ How do the food cultures contribute to the richness of gastronomic heritage?

Fermented (and non-fermented) foods contain a significant amount of microbial diversity, in particular, in raw foods. To meet the safety requirements for control of pathogens (ex: pasteurisation), the addition or inoculation with selected domestic food cultures derived from these raw products helps to control and improve the organoleptic qualities of food by perpetuating this organoleptic heritage.

TRUE OR FALSE ?

FOOD CULTURES, SOURCE OF INNOVATION

1. The fermentation of plants offers opportunities for innovation, such as new fermented beverages (ex: fermented carrot juice).
2. The French National Institute for Agricultural Research (INRA) carries out research on lactic acid bacteria used as a vector vaccine.
3. Researchers are increasingly interested in the role of microorganisms in fermented foods on our intestinal microbiota and our nervous system.
4. The use of certain food cultures of interest makes it possible to fight against pathogenic bacteria.

Answers: everything is true!



The French specialty food ingredients association
Find out more on www.synpa.org
<https://www.linkedin.com/company/synpa-les-ingredients-alimentaires-de-specialite>



Did you know?

+ Lemonade, a fermented drink

The origin of the bubbles in this drink comes from the fermentation of sugar, as for beer and kefir.

+ The eyes of the cheese

*The holes found in cheese, such as Swiss, are called "the eyes of the cheese". These are formed by the production of gas from the ripening bacteria *Propionibacterium freudenreichii*.*

+ Smear: the "know-how" of the cheese maker

This term, used by cheese makers, refers to the mixture consisting of salt and food cultures applied to the surface of the cheese to form the crust and give its characteristic thickness, texture, color and aroma. The smear can be applied by dipping, spraying or by rubbing with a brush.

+ I want chocolate!

For chocolate, it all starts with the fermentation of cocoa beans. Yeast and bacteria cooperate to release the aromas of chocolate. The addition of food cultures makes it possible to better control this crucial step.