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**Fermented milk products — Bacterial  
starter cultures — Standard of identity**

*Produits laitiers fermentés — Levains de cultures bactériennes —  
Norme de composition*

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## Foreword

**ISO (the International Organization for Standardization)** is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 27205|IDF 149 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 5, *Milk and milk products*, and the International Dairy Federation (IDF). It is being published jointly by ISO and IDF.

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## Foreword

**IDF (the International Dairy Federation)** is a non-profit organization representing the dairy sector worldwide. IDF membership comprises National Committees in every member country as well as regional dairy associations having signed a formal agreement on cooperation with IDF. All members of IDF have the right to be represented on the IDF Standing Committees carrying out the technical work. IDF collaborates with ISO in the development of standard methods of analysis and sampling for milk and milk products.

The main task of Standing Committees is to prepare International Standards. Draft International Standards adopted by the Standing Committees are circulated to the National Committees for endorsement prior to publication as an International Standard. Publication as an International Standard requires approval by at least 50 % of IDF National Committees casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. IDF shall not be held responsible for identifying any or all such patent rights.

ISO 27205|IDF 149 was prepared by the International Dairy Federation (IDF) and Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 5, *Milk and milk products*. It is being published jointly by IDF and ISO.

All work was carried out by the Joint ISO-IDF Project Group *Dairy starter cultures of lactic acid bacteria* of the Standing Committee on *Analytical Methods for Dairy Microorganisms* under the aegis of its project leaders, Mrs. S. Casani (DK) and Mrs. D. Ellekaer (DK).

This edition of ISO 27205|IDF 149 cancels and replaces IDF 149A:1997, which has been technically revised.

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# Fermented milk products — Bacterial starter cultures — Standard of identity

## 1 Scope

This International Standard specifies characteristics of industrial bacterial starter cultures, which are principally lactic acid bacteria (LAB), but which also include bifidobacteria and propionibacteria used for the manufacture of fermented milk products such as yoghurt, sour cream, cultured butter and cheese.

This International Standard does not apply to bacterial cultures which are added as an ingredient to foods only because of their probiotic properties.

## 2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 2.1

#### **bacterial starter culture**

prepared culture that contains one or several strains of microorganisms at high counts (in general more than  $10^8$  CFU/g or  $10^8$  CFU/ml of viable bacteria) being added to bring about a desirable enzymatic reaction (e.g. fermentation of lactose resulting in acid production, degradation of lactic acid to propionic acid or other metabolic activities directly related to specific product properties)

**EXAMPLE** The most important bacterial starter cultures consist of lactic acid bacteria (2.2), propionibacteria (2.3) and bifidobacteria (2.4) as described in this International Standard.

### 2.2

#### **lactic acid bacterium**

#### **LAB**

Gram-positive, non-motile, non-sporeforming, catalase-negative, nitrate-reductase-negative and cytochrome oxidase-negative bacterium that does not liquify gelatine or produce indole

**NOTE** LAB has a fermentative metabolism which is mainly saccharolytic. Lactic acid is the major end product from carbohydrate utilization.

**EXAMPLE** LAB of importance for the dairy industry are:

<i>Streptococcus thermophilus</i>	<i>Lactococcus lactis</i>	<i>Pediococcus</i>
<i>Enterococcus</i>	<i>Leuconostoc</i>	<i>Lactobacillus</i>

### 2.3

#### **propionibacterium**

Gram-positive, non-motile, non-sporeforming, generally catalase-positive, anaerobic to aerotolerant pleomorphic rod, that is often diptheroid or club shaped and may also be coccoid, bifid or branched

**NOTE** Propionibacterium is a chemoorganotroph and its fermentation products include large amounts of propionic and acetic acids and carbon dioxide. Its optimum growth temperature is between 30 °C and 37 °C.

**2.4**  
**bifidobacterium**

Gram-positive, non-motile, non-sporeforming, catalase-negative bacterium, that is often branched rod shaped and which has obligate anaerobic properties

NOTE Bifidobacterium is a chemoorganotroph and ferments sugars producing acetic and lactic acid. Its optimum growth temperature is between 37 °C and 41 °C. Its rods are arranged singly, in pairs, in V-arrangements, in chains, in palisades of parallel cells or in rosettes, occasionally exhibiting swollen coccoid forms.

**2.5**  
**food safety criterion**

condition determining the acceptability of a product or a batch of a foodstuff applicable to products placed on the market

NOTE See Reference [18].

**2.6**  
**process hygiene criterion**

condition determining the acceptable functioning of the production process, but which is not applicable to products placed on the market, setting an indicative contamination value above which corrective actions are required in order to maintain the hygiene of the process in compliance with food law

NOTE See Reference [18].

**3 Principle**

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A description is given of the characteristics of bacterial starter cultures regarding bacterial composition, cell concentration, contaminants, quality and safety management, and product information. It also provides a list of methods of analysis to assess compliance.

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**4 Description of bacterial starter cultures**

**4.1 Grouping depending on type and number of strains**

**4.1.1 Single-strain starter culture**

A single-strain starter culture is a starter culture that contains only one strain of a defined species.

**4.1.2 Single-species, multiple-strains starter culture**

A single-species, multiple-strains starter culture is a starter culture that contains more than one strain belonging to the same species. It may be an undefined mixed strain starter culture.

**4.1.3 Multiple-species starter culture**

A multiple-species starter culture is a starter culture that contains more than one species. It may contain one or more strains of each species. It may be an undefined multiple-species starter culture.

**4.2 Grouping depending on application temperature**

**4.2.1 Mesophilic bacteria used as starter cultures**

Mesophilic bacteria used as starter cultures are applied at temperatures ranging from about 18 °C to 37 °C. Mesophilic strains are widely used in cheese manufacturing and in other fermented milk products, such as buttermilk and sour cream.



The following bacteria are examples of mesophilic bacteria and can be used alone or in combination in the starter cultures specified in 4.1.1 to 4.1.3.

<i>Lactoc. lactis</i>	<i>Lactob. rhamnosus</i>
<i>Leucon. mesenteroides</i>	<i>Propionibacterium freudenreichii</i>
<i>Pedioc. pentosaceus</i>	<i>Bifidobacterium animalis</i>
<i>Lactob. casei</i>	<i>Bifidob. longum</i> subsp. <i>longum</i>
<i>Lactob. paracasei</i>	<i>Brevibacterium linens</i>

Examples of mesophilic single- and multiple-species starter cultures can be found in Table 1. Mesophilic LAB can be further differentiated depending on their metabolism. O-cultures are homofermentative and produce exclusively lactic acid. Citrate-positive organisms are contained in L-, D- and DL-cultures, which produce characteristically lactic acid plus volatile compounds with a characteristic odour, e.g. ethanol, acetaldehyde, diacetyl and acetate, and/or carbon dioxide during fermentation. Acidifying bacteria and *Leuconostoc* species are present in L-cultures, while D-cultures consist of acidifying bacteria and biovar. *diacetyllactis*. DL-Cultures consist of L- and D-cultures.

**Table 1 — Examples of mesophilic single- and multiple-species LAB starter cultures**

Type	Examples
O Single species	<i>Lactoc. lactis</i> subsp. <i>lactis</i> and/or <i>Lactoc. lactis</i> subsp. <i>cremoris</i>
L Multiple species	<i>Lactoc. lactis</i> subsp. <i>lactis</i> and/or <i>Lactoc. lactis</i> subsp. <i>cremoris</i> and, in addition, strain(s) of <i>Leuconostoc</i> e.g. <i>Leucon. mesenteroides</i> subsp. <i>cremoris</i> , <i>Leucon. lactis</i> , <i>Leucon. mesenteroides</i> subsp. <i>dextranicum</i> and <i>Leucon. mesenteroides</i> subsp. <i>mesenteroides</i>
D Single species	<i>Lactoc. lactis</i> subsp. <i>lactis</i> and/or <i>Lactoc. lactis</i> subsp. <i>cremoris</i> and, in addition, strain(s) of <i>Lactoc. lactis</i> subsp. <i>lactis</i> biovar. <i>diacetyllactis</i>
DL Multiple species	<i>Lactoc. lactis</i> subsp. <i>lactis</i> and/or <i>Lactoc. lactis</i> subsp. <i>cremoris</i> , and, in addition, strain(s) of <i>Lactoc. lactis</i> subsp. <i>lactis</i> biovar. <i>diacetyllactis</i> and of <i>Leuconostoc</i> (e.g. <i>Leucon. mesenteroides</i> subsp. <i>cremoris</i> , <i>Leucon. lactis</i> , <i>Leucon. mesenteroides</i> subsp. <i>dextranicum</i> , and <i>Leucon. mesenteroides</i> subsp. <i>mesenteroides</i> )

#### 4.2.2 Thermophilic bacteria used as starter cultures

Thermophilic bacteria used as starter cultures are applied at temperatures ranging from 30 °C to 45 °C. The culture is used in the production of fermented milks, e.g. yoghurt, and certain cheeses, e.g. Emmental and Grana.

The following bacteria are examples of thermophilic acidifying bacteria that can be used as starter cultures.

<i>Strep. thermophilus</i>	<i>Lactob. acidophilus</i>	<i>Bifidob. adolescentis</i>
<i>E. faecium</i>	<i>Lactob. fermentum</i>	<i>Bifidob. longum</i> subsp. <i>infantis</i>
<i>Lactob. helveticus</i>	<i>Lactob. gasseri</i>	<i>Bifidob. bifidum</i>
<i>Lactob. delbrueckii</i> subsp. <i>bulgaricus</i>	<i>Lactob. reuteri</i>	<i>Brevib. breve</i>
<i>Lactob. delbrueckii</i> subsp. <i>lactis</i>	<i>Lactob. rhamnosus</i>	

The aforementioned thermophilic bacteria may be used alone or in combination in the starter cultures specified in 4.1.1 to 4.1.3.

Examples of thermophilic single-species starter cultures are *Lactob. acidophilus* and *Lactob. helveticus*. An example of a thermophilic multiple-species starter culture (4.1.3) is yoghurt containing *Strep. thermophilus* and *Lactob. delbrueckii* subsp. *bulgaricus*.