INTERNATIONAL STANDARD

# ISO 22935-1

# IDF 99-1

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# Milk and milk products — Sensory analysis —

## Part 1: General guidance for the recruitment, selection, training and monitoring of assessors

*Lait et produits laitiers — Analyse sensorielle —*

*Partie 1: Lignes directrices générales pour le recrutement, la sélection, l'entraînement et le contrôle des sujets*

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

International Dairy Federation
Diamant Building • Boulevard Auguste Reyers 80 • B-1030 Brussels
Tel. + 32 2 733 98 88
Fax + 32 2 733 04 13
E-mail info@fil-idf.org
Web www.fil-idf.org

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# Contents

Page

# 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 22935-1 | IDF 99-1 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.

ISO 22935 | IDF 99 consists of the following parts, under the general title *Milk and milk products — Sensory analysis*:

— *Part 1: General guidance for the recruitment, selection, training and monitoring of assessors*

— *Part 2: Recommended methods for sensory evaluation*

— *Part 3: Guidance on a method for evaluation of compliance with product specifications for sensory properties by scoring*

# 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.

Draft International Standards adopted by the Action Teams and Standing Committees are circulated to the National Committees for voting. Publication as an International Standard requires approval by at least 50 % of the IDF National Committees casting a vote.

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All work was carried out by the Joint ISO-IDF Action Team on *Statistics and sampling* of the Standing Committee on *Quality assurance, statistics of analytical data and sampling* under the aegis of its project leader: Ms. V. Jones (NZ).

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This edition of ISO 22935-1 | IDF 99-1, together with ISO 22935-2 | IDF 99-2 and ISO 22935-3 | IDF 99-3, cancels and replaces IDF 99C:1997, which has been technically revised.

# Introduction

The purpose of ISO 22935|IDF 99 (all parts) is to give guidance on methodology for sensory analysis and the use of a common nomenclature of terms for milk and milk products.

To achieve that, ISO 22935|IDF 99 has been divided into the three parts listed in the forewords.

ISO 6658 should be consulted for an overview of sensory methods other than the one provided in ISO 22935-3|IDF 99-3.

Evaluation of labelling and packaging is not covered by ISO 22935|IDF 99 (all parts).

The principles described are largely derived from various International Standards on the topic.

# Milk and milk products — Sensory analysis —

# Part 1:
# General guidance for the recruitment, selection, training and monitoring of assessors

## 1 Scope

This part of ISO 22935|IDF 99 gives general guidance for the recruitment, selection, training, and monitoring of assessors for sensory analysis of milk and milk products.

It specifies criteria for the selection, and procedures for the training and monitoring, of selected assessors and expert sensory assessors for milk and milk products. It supplements the information given in ISO 8586-1 and parts of ISO 8586-2 that deal with expert assessors.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4120, *Sensory analysis — Methodology — Triangle test*

ISO 4121, *Sensory analysis — Guidelines for the use of quantitative response scales*

ISO 5492:2008, *Sensory analysis — Vocabulary*

ISO 5496, *Sensory analysis — Methodology — Initiation and training of assessors in the detection and recognition of odours*

ISO 6658, *Sensory analysis — Methodology — General guidance*

ISO 8586-1:1993, *Sensory analysis — General guidance for the selection, training and monitoring of assessors — Part 1: Selected assessors*

ISO 8586-2, *Sensory analysis — General guidance for the selection, training and monitoring of assessors — Part 2: Expert sensory assessors*

ISO 8587, *Sensory analysis — Methodology — Ranking*

ISO 8589, *Sensory analysis — General guidance for the design of test rooms*

ISO 22935-2|IDF 99-2:2009, *Milk and milk products — Sensory analysis: Part 2: Recommended methods for sensory evaluation*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4121, ISO 5492, ISO 5496, ISO 6658, ISO 8586-1, ISO 8586-2 and ISO 8589 and the following apply.

**3.1**
**sensory analysis**
science involved with the assessment of the organoleptic attributes of a product by the senses

[ISO 5492:2008, 1.1]

**3.2**
**selected assessor**
assessor chosen for his/her ability to perform a sensory test

[ISO 5492:2008, 1.6]

**3.3**
**expert sensory assessor**
selected assessor with a demonstrated sensory sensitivity and with considerable training and experience in sensory testing, who is able to make consistent and repeatable sensory assessments of various products

[ISO 5492:2008, 1.8]

NOTE Examples of “various products” are “dairy products”.

**3.4**
**sensory panel**
group of assessors participating in a sensory test

[ISO 5492:2008, 1.9]

**3.5**
**scoring**
evaluation of a product (or of attributes of a product) by assigning numbers that have some mathematical relationship to the product or attributes being evaluated

[ISO 5492:2008, 4.7]

**3.6**
**product specification**
document stating requirements of a product

NOTE Adapted from ISO 9000:2005[2].

**3.7**
**classification**
method of sorting into categories

[ISO 5492:2008, 4.5]

**3.8**
**attribute**
perceptible characteristic

[ISO 5492:2008, 1.3]

**3.9**
**appearance**
all the visible attributes of a substance or object

[ISO 5492:2008, 3.1]

NOTE For a dairy product, the visual attributes are both internal and external, and include shape, colour, and openings.

**3.10**
**consistency**
mechanical attribute detected by stimulation of the tactile or visual receptors

[ISO 5492:2008, 3.49]

**3.11**
**mouthfeel**
mixed experience derived from sensations in the mouth that relate to physical or chemical properties of a stimulus

[ISO 5492:2008, 3.62]

**3.12**
**fingerfeel**
mixed experience derived from sensations on the fingers that relate to physical properties of a stimulus

**3.13**
**flavour**
complex combination of the olfactory, gustatory and trigeminal sensations perceived during tasting

[ISO 5492:2008, 3.20]

**3.14**
**odour**
sensation perceived by means of the olfactory organ in sniffing certain volatile substances

[ISO 5492:2008, 3.18]

## 4 Recruitment

Assessors can be recruited from within a company (laboratory staff, production staff, administration staff, etc.), who are not involved with project work, or from outside a company. Outside assessors can be recruited by advertisement or by word of mouth. The panel candidates should have an understanding of the amount of time that will be required for the screening process and for actual panel work. A large enough pool of available candidates should be screened in order to have enough assessors available to select from when forming a panel. The trainee assessor should have satisfactory personal qualifications for assessments and should be pre-selected by:

a) the use of screening tests to assess the ability of candidates to perceive, discriminate, and describe sensory attributes;

b) a general understanding of the concepts of sensory evaluation;

c) a general liking or interest in dairy products.

# 5 Screening

## 5.1 Screening form and requirements

### 5.1.1 General

Potential applicants should go through two forms of screening via an interview and sensory screening tests. During the interview, the applicants should fill out a pre-screening form which indicates the times that they are available for panels and any health issues they may have: arthritis which could interfere with the evaluation of product texture in-hand (fingerfeel), lactose intolerance, wearing of dentures, smoking status, and any other issues of concern.

Flavoured water solutions and dairy products should be used to indicate if the potential assessor can recognize specific tastes or flavours at different intensities. The potential evaluator shall be able to detect certain flavours within complex dairy products. The following three sessions each take assessors approximately 45 min to 1 h to complete. These screening exercises are suggestions only and may be adapted to the application area of the assessors. The sessions described in 5.1.2 to 5.1.4 may be broken down into smaller or larger sessions depending on how much time is available.

### 5.1.2 Session 1 — Basic odour and taste recognition

| Test | Reference | Result |
|---|---|---|
| 1 | 5.3.1 | Odour recognition |
| 2 | 5.3.2 | Basic taste recognition |
| 3 | 5.3.3, Table 5 | Ranking of basic taste — sweet |
| 4 | 5.3.3, Table 6 | Ranking of basic taste — sour |
| 5 | 5.3.3, Table 7 | Ranking of basic taste — salty |
| 6 | 5.3.3, Table 8 | Ranking of basic taste — bitter |

### 5.1.3 Session 2 — Milk powder and cream products

| Test | Reference | Result |
|---|---|---|
| 7 | 5.3.4, Table 11 | Triangle test — milk powder |
| 8 | 5.3.4, Table 12 | Triangle test — butter |
| 9 | 5.3.4, Table 12 | Triangle test — salted butter |
| 10 | 5.3.5.2 | Round table discussion — cream evaluation |
| 11 | 5.3.3, Table 9 | Ranking of texture — body/creaminess |
| 12 | 5.3.4, Table 11 | Triangle test — aged milk powder |

### 5.1.4 Session 3 — Cheese

| Test | Reference | Result |
|---|---|---|
| 13 | 5.3.4, Table 13 | Triangle test — cheese |
| 14 | 5.3.5.1 | Round table discussion — cheese evaluation |
| 15 | 5.3.4, Table 13 | Triangle test — bitter cheese |
| 16 | 5.3.4, Table 14 | Triangle test — cheese firmness |
| 17 | 5.3.4, Table 14 | Triangle test — cheese smoothness |

Mark each section as per each marking schedule. Other examples of screening exercises can be found in ISO 8586-1.

## 5.2 Preparation of test samples for screening

**5.2.1** If possible, prepare test samples on the day of the evaluation.

**5.2.2** For screening purposes, it is easier to serve test samples in the same order to all assessors.

**5.2.3** If appropriate, use test sample questionnaires for all screening exercises found in ISO 4120 (triangle test), ISO 8587 (ranking test), ISO 6658 and ISO 4121 (scales).

## 5.3 Screening tests, materials and methods

The screening tests, materials and methods presented in this section are recommendations only. They can be adapted to suit the needs of an individual company.

### 5.3.1 Odour recognition

Follow the instructions outlined in ISO 8586-1:1993, 4.4.6.1 for details on how to prepare the test samples and conduct this test. Table 1 suggests other aromas that can be used.

**Table 1 — Examples of olfactory materials for odour description test**

| Blind code (example) | Sample Preparation |
|---|---|
| 981 | Citronella oil (lemon, cleaning fluid) |
| 194 | Orange |
| 229 | Caramel |
| 371 | Butyric acid |
| 926 | Acetic acid |
| 174 | Ammonia |
| 746 | (*Z*)-hex-3-en-1-ol[a] |
| 831 | Oct-1-en-3-ol |
| 556 | Vanilla |

[a] In older literature, known as *cis*-hex-3-en-1-ol.

Candidates are graded according to performance, as shown in Table 2. For each sample, a total of three points can be achieved. If the assessor uses words other than those listed in Table 2, score appropriately.

**Table 2 — Marking schedule for odour recognition**

| Sample | Correct Answer | | |
|---|---|---|---|
| | 3 points | 2 points | 1 point |
| Citronella oil | Citronella oil | Lemony, cleaning fluid | Citrus, fruity |
| Orange | Orange | Lemon | Citrus, fruity |
| Caramel | Caramel | Vanilla, malt, toasted | Sweet |
| Butyric acid | Rancid butter | Parmesan cheese | Vomit, baby burp |
| Acetic acid | Acetic acid | Vinegar | Sour/off milk |
| Ammonia | Ammonia | Cleaning fluid, urine | Pungent |
| (*Z*)-hex-3-en-1-ol | Green grass | Green beans | Green vegetable |
| Oct-1-en-3-ol | Mushroom | Cellar, musty | Mouldy |
| Vanilla | Vanilla | Custard, dessert | Sweets, candy |

### 5.3.2 Basic taste recognition

The solutions can be prepared as shown in Table 3. Present the solutions to the assessors in the same order. Ask the assessor to identify the basic taste that is represented by the solution.

**Table 3 — Basic taste solutions**

| Blind code (examples) | Answer | Concentration | Sample preparation |
|---|---|---|---|
| 683 | Sweet | 10 g/l sucrose (1 % mass fraction) | 10 g sucrose + 1 l water |
| 429 | Salty | 2 g/l NaCl (0,2 % mass fraction) | 2 g NaCl + 1 l water |
| 662 | Sour | 0,3 g/l citric acid (0,03 % mass fraction) | 0,3 g citric acid + 1 l water |
| 353 | Bitter | 0,3 g/l caffeine (0,03 % mass fraction) | 0,3 g caffeine + 1 l water |
| 768 | Umami (optional) | 0,6 g/l monosodium glutamate (0,06 % mass fraction) | 0,6 g monosodium glutamate or 0,18 g umami mixture (50 % mass fraction monosodium glutamate, 25 % mass fraction 5'- guanylic acid, 25 % mass fraction inosinic acid) + 1 l water with 0,5 g NaCl |
| 418 | Water | | water |

Candidates are graded according to performance on the scale shown in Table 4.

**Table 4 — Gradation scale I**

| Points | Result |
|---|---|
| 6 | all correct |
| 5 | five correct |
| 4 | four correct |
| 3 | three correct |
| 2 | two correct |
| 1 | one correct |
| 0 | none correct |

### 5.3.3 Ranking tests

A minimum of four test samples should be ranked in order of increasing intensity. This test will indicate whether the assessor can tell the difference between samples for certain basic tastes.

Samples for ranking of sweetness, sourness, saltiness, bitterness, and creamy flavour are given in Tables 5, 6, 7, 8, and 9, respectively.

This test can also indicate the threshold levels of assessors (i.e. if the assessor did not correctly identify the order of the lower intensities, that would indicate that this assessor cannot taste at lower levels for this particular attribute).

NOTE All samples are randomized, but are presented to all the assessors in the same order.

**Table 5 — Sweet ranking**

| Blind code (examples) | Correct ranking | Concentration | Sample preparation |
|---|---|---|---|
| 478 | 3 | 10 g/l sucrose (1 % mass per volume) | 10 g sucrose + 1 l water |
| 753 | 1 | Water | Water |
| 578 | 4 | 15 g/l sucrose (1,5 % mass per volume) | 15 g sucrose + 1 l water |
| 248 | 2 | 5 g/l sucrose (0,5 % mass per volume) | 5 g sucrose + 1 l water |

**Table 6 — Sour ranking**

| Blind code (examples) | Correct ranking | Concentration | Sample preparation |
|---|---|---|---|
| 145 | 2 | 0,10 g/l citric acid (0,01 % mass per volume) | 0,10 g citric acid + 1 l water |
| 249 | 4 | 0,5 g/l citric acid (0,05 % mass per volume) | 0,5 g citric acid + 1 l water |
| 871 | 1 | Water | Water |
| 675 | 3 | 0,3 g/l citric acid (0,03 % mass per volume) | 0,3 g citric acid + 1 l water |

**Table 7 — Salt ranking**

| Blind code (examples) | Correct ranking | Concentration | Sample preparation |
|---|---|---|---|
| 985 | 2 | 1 g/l NaCl (0,1 % mass per volume) | 1 g NaCl + 1 l water |
| 813 | 1 | Water | Water |
| 713 | 4 | 2 g/l NaCl (0,2 % mass per volume) | 2 g NaCl + 1 l water |
| 632 | 3 | 1,5 g/l NaCl (0,15 % mass per volume) | 1,5 g NaCl + 1 l water |

**Table 8 — Bitter ranking**

| Blind code (examples) | Correct ranking | Concentration | Sample preparation |
|---|---|---|---|
| 268 | 2 | 0,1 g/l caffeine (0,01 % mass per volume) | 0,1 g caffeine + 1 l water |
| 634 | 1 | Water | Water |
| 919 | 4 | 0,5 g/l caffeine (0,05 % mass per volume) | 0,5 g caffeine + 1 l water |
| 752 | 3 | 0,3 g/l caffeine (0,03 % mass per volume) | 0,3 g caffeine + 1 l water |

**Table 9 — Creamy flavour ranking**

| Blind code (examples) | Correct ranking | Sample preparation |
|---|---|---|
| 268 | 1 | UHT non-fat |
| 634 | 4 | UHT full fat + 20 % volume fraction UHT cream |
| 919 | 3 | UHT full fat + 3 % volume fraction UHT cream |
| 752 | 2 | UHT full fat |

Candidates are graded according to performance on the scale shown in Table 10.

**Table 10 — Gradation scale II**

| Points | Result |
|---|---|
| 4 | Four correct |
| 3 | Adjacent switch |
| 1 | One correct |
| 0 | None correct |

### 5.3.4 Difference testing

Difference testing indicates if the individual can detect small differences between samples for certain flavours or textures.

The test samples should be selected so that they test the capability of the assessor to discriminate between the samples based only on flavour or texture. An expert assessor can be used to select the samples to be used in the tests.

“Paired comparison” or “triangle” testing should be conducted on a series of products. If the assessor thinks the samples are different, they can be asked to indicate what the difference is. This indicates if assessors can accurately identify differences between products and name the difference.

All test samples are to be presented to all assessors in the same randomized order. Refer to ISO 22935-2 | IDF 99-2:2009, 9.2, for instructions on how to prepare milk powder samples.

It is recommended that each set of samples be presented to the assessors twice to check if assessors can replicate their results.

**Table 11 — Suggested milk powder samples for difference testing — Flavour**

| Product | Blind code (examples) | Answer | Sample preparation (30 ml per assessor) 100 % mass fraction |
|---|---|---|---|
| Milk powder sample set No. 1 | 737 | | Skim milk powder |
| | 932 | | Skim milk powder |
| | 895 | Different | Whole milk powder |
| Milk powder sample set No. 2 | 769 | | Skim milk powder |
| | 862 | Different | Whole milk powder |
| | 374 | | Skim milk powder |
| Aged milk powder sample set No. 1 | 191 | Different | Oxidized milk powder[a] |
| | 748 | | Fresh milk powder |
| | 651 | | Fresh milk powder |
| Aged milk powder sample set No. 2 | 426 | | Fresh milk powder |
| | 621 | | Fresh milk powder |
| | 848 | Different | Oxidized milk powder[a] |

[a] Refer to Table 25 for instructions on preparing oxidized milk samples.

**Table 12 — Suggested butter samples for difference testing — Flavour**

| Product | Blind code (examples) | Answer | Sample preparation (1 cube per assessor) |
|---|---|---|---|
| Butter sample set No. 1 [a] | 148 | | Butter type 1 |
| | 897 | | Butter type 1 |
| | 198 | Different | Butter type 2 |
| Butter sample set No. 2 [a] | 539 | | Butter type 1 |
| | 575 | Different | Butter type 2 |
| | 272 | | Butter type 1 |
| Salted butter sample set No. 1 | 514 | | Unsalted butter |
| | 796 | | Unsalted butter |
| | 244 | Different | Salted butter |
| Salted butter sample set No. 2 | 868 | | Unsalted butter |
| | 364 | | Unsalted butter |
| | 968 | Different | Salted butter |

[a] The butters used in this test can be two different brands of butter, butter with known flavour differences or “spiked” butter samples [e.g. regular butter and a grassy butter (butter with 1,5 % mass fraction hexanal)].

**Table 13 — Suggested cheese samples for difference testing — Flavour**

| Product | Blind code (examples) | Answer | Sample preparation |
|---|---|---|---|
| Cheese sample set No. 1 | 345 | | Cheese type 1 |
| | 223 | Different | Cheese type 2 |
| | 466 | | Cheese type 1 |
| Cheese sample set No. 2 [a] | 342 | | Cheese type 1 |
| | 555 | | Cheese type 1 |
| | 314 | Different | Cheese type 2 |
| Bitter cheese sample set No. 1 | 871 | | Non-bitter cheese |
| | 914 | | Non-bitter cheese |
| | 557 | Different | Bitter cheese |
| Bitter cheese sample set No. 2 | 997 | | Non-bitter cheese |
| | 663 | Different | Bitter cheese |
| | 783 | | Non-bitter cheese |

[a] The cheese samples used in this test can be two different brands of cheese or cheeses with known flavour differences.

**Table 14 — Suggested cheese samples for difference testing — Texture**

| Product | Blind code (examples) | Answer | Sample preparation |
|---|---|---|---|
| Cheese — firmness sample set No. 1 | 278 | Different | Cheese firmness — brand 1 |
| | 921 | | Cheese firmness — brand 2 |
| | 461 | | Cheese firmness — brand 1 |
| Cheese — firmness sample set No. 2 | 476 | Different | Cheese firmness — brand 2 |
| | 133 | | Cheese firmness — brand 1 |
| | 931 | | Cheese firmness — brand 1 |
| Cheese — smoothness sample set No. 1 | 119 | Different | Cheese smoothness — brand 1 |
| | 346 | | Cheese smoothness — brand 2 |
| | 278 | | Cheese smoothness — brand 2 |
| Cheese — smoothness sample set No. 2 | 563 | Different | Cheese smoothness — brand 2 |
| | 572 | | Cheese smoothness — brand 1 |
| | 588 | | Cheese smoothness — brand 2 |

Candidates are graded according to performance on scale III (Table 15).

**Table 15 — Gradation scale III**

| Points | Result |
|---|---|
| 6 | Correct response for both sample set #1 and sample set #2 |
| 4 | Correct response for either sample set #1 or sample set #2 |
| 0 | Incorrect response for both sample set #1 and sample set #2 |
| 0,5 | Correct description of difference |

### 5.3.5 Descriptive ability and group discussion

During a group discussion, the candidates taste a product and generate descriptive terms for that product by themselves. The candidates discuss their result with the other assessors (minimum of eight in a group). This indicates if a candidate can break a product down into descriptive terms and how the candidate interacts within group discussions.

Choose two types of dairy products for the descriptive discussion groups. This part of ISO 22935|IDF 99 gives examples for cheese and cream samples; other samples can be selected depending on the types of products that are commonly evaluated by panels. Ask the candidates to evaluate the samples presented and write down all the descriptive words they can think of for the odour, texture and flavour of the products. Once the evaluation has been conducted, get the group to discuss the samples and their differences.

#### 5.3.5.1 Cheese

Samples are proposed in Table 16.

**Table 16 — Suggested cheese samples for discussion groups**

| Blind code (examples) | Sample preparation |
|---|---|
| 524 | Mild Cheddar cheese |
| 831 | Blue vein cheese |

Candidates are graded according to performance on scale IV (Table 17). Check all the descriptors that the candidates generated and give them appropriate marks based on how many descriptors they generated and how accurately they described the samples.

**Table 17 — Gradation scale IV**

| Points | Result |
|---|---|
| 1 (max. of 1) | 1 point for each correct odour comment to a maximum of 1 point |
| 1 (max. of 2) | 1 point for each correct texture comment to a maximum of 2 points |
| 1 (max. of 4) | 1 point for each correct flavour comment to a maximum of 4 points |

If candidates use words other than those listed in Table 18, score appropriately.

For the discussion: mark each individual out of 10 (10 being the best score) on how they contributed to the group discussion and how well the individual can convey what they are saying.

**Table 18 — Suggested odour, texture and flavour descriptions for mild Cheddar and blue vein cheeses**

| Product | Odour | Texture | Flavour |
|---|---|---|---|
| Mild Cheddar | Cheesy | Firm<br>Hard<br>Dry | Salty<br>Creamy<br>Cheesy<br>Sharp |
| Blue vein | Sharp<br>Acidic<br>Vomit<br>Mouldy | Crumbly<br>Moist<br>Lumpy | Salty<br>Sharp<br>Vomit<br>Mushroom<br>Mouldy |

#### 5.3.5.2 Cream

Samples are proposed in Table 19.

**Table 19 — Suggested cream samples for discussion groups**

| Blind code (examples) | Sample Preparation |
|---|---|
| 967 | Full cream (whipped until peaks are formed) |
| 491 | Aerosol cream |

Candidates are graded according to performance on scale V (Table 20). Check all the descriptors that the candidates generated and give them appropriate marks based on how many descriptors they generated and how accurately they described the samples.

**Table 20 — Gradation scale V**

| Points | Result |
|---|---|
| 1 (max. of 1) | 1 point for each correct odour comment to a maximum of 1 point |
| 1 (max. of 2) | 1 point for each correct texture comment to a maximum of 2 points |
| 1 (max. of 3) | 1 point for each correct flavour comment to a maximum of 3 points |

If candidates use words other than those listed in Table 21, score appropriately.

For the discussion: mark each individual out of 10 (10 being the best score) on how they contributed to the group discussion and how well the individual can convey what they are saying.

**Table 21 — Suggested odour, texture and flavour descriptions for whipped full cream and aerosol cream**

| Product | Odour | Texture | Flavour |
|---|---|---|---|
| Whipped full cream | Milky<br>Creamy | Thick<br>Heavy | Buttery<br>Unsweetened<br>Creamy |
| Aerosol cream | Milky<br>Creamy | Light<br>Fluffy<br>Aerated/foamy<br>Soft | Vanilla<br>Sweet<br>Creamy |

### 5.3.6 Marking schedule summary

The marking schedule in Table 22 is an example based on the guidelines set in 5.3.

**Table 22 — Marking schedule for all tests**

| Test No. | Section | Table | Title | Maximum score possible |
|---|---|---|---|---|
| 1 | 5.3.1 | | Odour recognition | 27 |
| 2 | 5.3.2 | | Basic taste recognition | 6 |
| 3 | 5.3.3 | 5,6,7,8 | Ranking of basic taste | 16 |
| 4 | 5.3.3 | 9 | Ranking of texture — body/creaminess | 4 |
| 5 | 5.3.5.1 | | Descriptive cheese evaluation | 7 |
| 6 | 5.3.5.1 | | Round table discussion — cheese evaluation | 10 |
| 7 | 5.3.4 | 11,12,13 | Triangle test — flavour | 36 |
| 8 | 5.3.4 | 14 | Triangle test — texture | 12 |
| 9 | 5.3.5.2 | | Descriptive cream evaluation | 6 |
| 10 | 5.3.5.2 | | Round table discussion — cream evaluation | 10 |

## 6 Selection

Guidelines for selection of panel members according to the marking schedule in 5.3.6 are listed in Table 23 and as follows:

a) adequate completion of the pre-screening questionnaire;

b) overall score of 65 % or greater in a combination of the odour recognition, basic taste recognition, ranking of basic taste, and ranking of texture — body/creaminess tests;

c) overall score of 50 % or greater for the descriptive tests;

d) panel members shall receive a discussion performance score of 5 or better;

e) panel members shall obtain correct scores in at least 65 % of the triangle tests;

f) candidates who achieve less than 65 % of the total score are unsuitable as sensory evaluators.

**Table 23 — Suggested test scores for panellist selection**

| Test No. | Title | Maximum score possible | Recommended pass mark | Pass score |
|---|---|---|---|---|
| 1+2+3+4 | Recognition and ranking tests | 57 | 65 % | > 38/57 |
| 5+9 | Descriptive tests | 13 | 50 % | > 7/13 |
| 6 | Round table discussion — cheese evaluation | 10 | 5 | > 5/10 |
| 10 | Round table discussion — cream evaluation | 10 | 5 | > 5/10 |
| 7+8 | Triangle test — flavour and texture | 42 | 65 % | > 28/42 |

The following factors should also be considered when selecting panel members:

1) motivation, enthusiasm, positive attitude;

2) provision of regular constructive feedback on performance;

3) good descriptive ability;

4) reliable sensory acuity;

5) good general health, no allergies to dairy products;

6) ability to attend at least 80 % of training and evaluation sessions;

7) excellent communication skills (especially verbal).

Other important characteristics to look for in screening are how well the potential panel members can participate in a group. It is not desirable to have people that are:

8) very outspoken and opinionated;

9) very quiet and withdrawn;

10) argumentative.

Ideally, assessors should be able to put forward an opinion when requested and listen to other ideas with an open mind.

# 7 Requirements for assessors in the panel

The number of assessors on a panel depends on the type and the objective of the evaluation being conducted (e.g. quality control, grading or research).

At least the following factors should be taken into consideration for optimum performance of assessors before product testing occurs.

1) The assessor should not be suffering from any illness which may affect their performance. Under such circumstances another assessor should join the panel.

2) The assessors should be in time for the assessment and make sure they have spared enough time for the assessment.

3) The assessors should not use any perfume at all nor any aftershave, scented deodorant and hand lotion nor eat highly flavoured/spiced food (prior to testing), etc.

4) The assessors should not smoke, eat or drink anything other than water during the last half-hour before the assessment.

# 8 Training and monitoring of assessors for dairy products

## 8.1 General

Training shall be ongoing and general training sessions should be held on a regular basis. The training sessions should be a key component of the monitoring programme. Refer to ISO 8586-1 for further information on panel training.

The trainee should not be accepted as a selected assessor (3.2) or expert sensory assessor (3.3) of dairy products before the person is able to reach results that are sufficiently in accordance with the results of a sensory panel of experienced assessors. The trainee should be able to duplicate the scores and the use of nomenclature.

The initial training programme should contain the following elements:

a) theory about factors of practical importance for sensory evaluation;

b) general training on methods, scales, and description of sensory attributes;

c) general training on detection and recognition of sensory attributes and specific sensory terms;

d) general training on how dairy products are manufactured and the importance of sensory evaluation for dairy products;

e) thorough training in sensory evaluation of the dairy products to be evaluated;

f) validated references that help the assessor identify specific flavours and intensities within a product.

## 8.2 References

References are recommended for the training of the more common flavour attributes within dairy products. The flavour attributes can be generated by the panel for each product or selected by the panel leader. If possible, food grade chemicals can be used in solution or added to specific dairy products so that the assessor understands how that flavour relates to the actual product characteristics. The training references depend on the type of evaluation being done (quality scoring or profiling).

Training should be done on the basic tastes (sweet, sour, bitter, salt, umami) as shown in Table 24 and selected dairy attributes. All training references should be assessed at the same temperature as the dairy products. Examples of references that can be used to train assessors to recognize some of the specific dairy product attributes can be found in Table 25.

**Table 24 — Training references for basic tastes**

| Basic taste | Reference product | Concentration | Preparation comments[a] |
|---|---|---|---|
| Sour | Lactic or citric acid | 0,3 g/l (0,03 % mass per volume) | 0,3 g lactic acid + 1 l water<br>0,3 g citric acid + 1 l water |
| Bitter | Caffeine | 0,3 g/l (0,03 % mass per volume) | 0,3 g caffeine + 1 l water |
| Salty | Sodium chloride | 2,0 g/l (0,2 % mass per volume) | 2,0 g NaCl + 1 l water |
| Sweet | Sucrose | 10 g/l (1 % mass per volume) | 10 g sucrose + 1 l water |
| Umami | Monosodium glutamate (MSG) | 0,6 g/l (0,06 % mass per volume) | 0,6 g $C_5H_8NNaO_4$ + 1 l water |

[a] These are suggested concentrations only. Concentrations can vary depending on the products being evaluated.

**Table 25 — Suggested training references for selected milk and milk product attributes**

| Attribute | Reference Product | Preparation |
|---|---|---|
| Acetic | Wine vinegar | |
| Ammonia | Ammonium hydroxide solution | 1 ml of $NH_4OH$ at 25 % mass fraction in 500 ml water (aroma only) |
| Astringent | Tea | Soak 6 black tea bags (2.5 g each) in 500 ml water at 80 °C for 10 min (Reference [7]) |
| Astringent | Tannic acid | 100 mg of tannic acid powder per 100 ml water |
| Apricot | Mature apricot | |
| Barny/cowy | *p*-cresol | 20 mg/kg *p*-cresol in skim milk (Reference [7]) |
| Butyric | Butyric acid | Add 20 mg/kg of butyric acid to 95 % volume fraction ethanol (Reference [5]) or 0,1 g/l water (Reference [10]) |
| Burnt | Over-toasted bread slice | Grill bread until the appearance of black carbonized areas. Crumble these areas before presenting them |
| Burnt | Milk | Pour 50 ml of milk into a pot until the bottom of the pot is just covered. Cook on high heat until the milk starts to burn and most of the liquid has evaporated (approx. 2 min). Remove pot from heat. Add 450 ml of uncooked milk. Sieve and pour into a container |
| Butter, fresh | Butter | Freshly made dairy butter (Reference [9]) |
| Butter, fruity | Butter | Place butter pieces, apples and oranges cut into pieces into the container. Keep covered in the dark at + 8 °C for 24 h |
| Butter, light induced/ oxidized | Butter | Place butter pieces under a light source at +8 °C for 24 h |
| Rancid, butter | Butter | Place butter pieces and a piece of cotton wool wetted with 0,15 ml of butyric acid into the container. Keep covered in the dark at + 8 °C for 24 h |
| Butter, rendered | Butter | Fresh butter melted in a bain-marie (Reference [9]) |
| Caramel | Milk | Autoclave milk at 121 °C for 30 min (Reference [5]) |

**Table 25** (*continued*)

| Attribute | Reference Product | Preparation |
|---|---|---|
| Caramel | Liquid caramel | Liquid caramel sold for cooking. Caramel with a dark-brown colour. Dilute one volume with two volumes warm water (Reference [9]) |
| Cardboard | Cardboard paper | Soak pieces of cardboard paper in skim milk over night (aroma only) (Reference [5]) |
| Cereal | Breakfast cereal (e.g. cornflakes) | Soak one cup of breakfast cereal in three cups milk for 30 min and filter to remove cereals (Reference [5]) |
| Chemical, milk | Acetone | Add 0,7 ml of acetone to 1 l of semi-skimmed milk. Store in a refrigerator overnight (aroma only) |
| Chemical, butter | Butter | Place butter pieces and a piece of cotton wool wetted with 1 ml acetone in the container with tight lid. Keep covered in the dark at + 8 °C for 24 h |
| Clove | Clove | Put a clove in cotton wool and allow to stand until the cotton wool has absorbed the clove odour (aroma only) |
| Cooked, milk | Milk | Heat pasteurized skim milk to 85 °C for 45 min (Reference [5]) |
| Cooked, cheese | Melted cheese | Place 3 mm slices of mild Cheddar on sliced bread. Bake at 180 °C for 20 min |
| Cooling | Menthol | Stock solution (SS) to be stored in a refrigerator (5 °C to 7 °C): 0,2 g of menthol in 25 ml of 100 % volume fraction ethanol. Then dilute 1 ml of SS with 9 ml water |
| Cow shed | Clean straw | Collect clean straw on which the cow has rested in the shed (aroma only) (Reference [9]) |
| Creamy | Cream | Fresh cream (40 % mass fraction fat) |
| Curd acidified | Coagulated quark or whole raw milk | Quark or whole raw milk which has coagulated spontaneously after acidification (Reference [9]) |
| Diacetyl | Diacetyl<br>Butane-2,3-dione | 20 mg/kg on filter paper (aroma only) (Reference [5]) |
| Earthy (humus) | Soil | Collect soil with decomposing leaves and twigs in dense woody vegetation (aroma only) (Reference [9]) |
| Fatty, fried | (2*E*,4*E*)-deca-2,4-dienal[a] | 2 µg/kg in skim milk |
| Faecal | Skatole | 0,05 mg/kg of skatole in milk |
| Fishy | Tuna | Canned tuna juice (Reference [5]) |
| Fishy (spoiled fish) | Trimethylamine | 45 mg/l aqueous solution |
| Floral | General | 20 mg/kg of 2-phenethylamine in 95 % volume fraction ethanol (aroma only) (Reference [4]) |
| Fruity, fermented | Apple | Apple at the start of fermentation (Reference [9]) |
| Fruity, pineapple | Ethyl hexanoate or pineapple | Fresh pineapple, pineapple juice or 20 mg/kg of ethyl hexanoate (Reference [4]) |
| Grass, newly mown | Green grass | Mixture of newly mown green grasses (aroma only) (Reference [9]) |
| Grass, wet | (*Z*)-hex-3-en-1-ol | 5 mg/kg in water (weak) or 50 mg/kg (strong) (Reference [10]) |
| Hay | Harvested hay | Harvested hay matured in good storage conditions. Cut it into small pieces with scissors (aroma only) (Reference [9]) |
| Lactone | Dodecalactone | Add 40 µl of 0,1 mg/kg dodecalactone to milk and mix thoroughly |
| Light induced (oxidized) | Milk | Place 1 l of semi-skimmed milk in a transparent glass container under UV light for 1 h to 2 h. Store milk in a refrigerator overnight before the test |
| Meat broth | Skimmed broth | Skimmed broth cooked without vegetables (beef) (Reference [9]) |

**Table 25** (*continued*)

| Attribute | Reference Product | Preparation |
|---|---|---|
| Metallic | Iron mineral pills | Grind iron mineral pills and dissolve in water |
| Metallic | Iron(II) sulfate | 1 g of $FeSO_4$ $7H_2O$ diluted in 1 l water |
| Milk, fresh | Milk | Cow's milk collected during the day (Reference [9]) |
| Mushroom | Mushroom | 10 000 mg/kg of 3-octanol in 1 % propyleneglycol (Reference [10]) |
| Musty | Reminiscent of damp basement | Aroma only |
| Musty | 2,4,6-trichloroanisole | Wet a piece of cotton wool with 0,04 % volume fraction 2,4,6-trichloroanisole and place in a brown glass bottle (aroma only) |
| Onion | Straw yellow onion | Peel a straw yellow onion, cut into small pieces, boil for 5 min and then crush with a little of the water used for cooking (Reference [9]) |
| Oxidized | Fresh milk | Place a fresh milk sample under UV light for 12 h |
| Oxidized (metal) | $CuSO_4$ | Add 2 ml of 2 % mass fraction $CuSO_4$ solution in 1 l of semi-skimmed milk. Store milk in refrigerator 48 h before test |
| Painty | (2*E*,4*E*)-deca-2,4-dienal [a] | 2 µg/kg of (2*E*,4*E*)-deca-2,4-dienal in skim milk (Reference [5]) |
| Potato | Puréed potatoes | Peel, cut, and boil potatoes for 10 min to 15 min. Then mash them adding a little cooking water (Reference [9]) |
| Potato (alternative) | Methional | 2 µl in 50 ml water, wet a piece of cotton wool with 1 ml of the solution |
| Propionic | Propionic acid | Propionic acid (1 mg/l) (Reference [9]) |
| Rancid | Butyric acid | 4 µl in 80 ml water, place 1 ml of mixture in a 30 ml beaker and cover |
| Salt | Milk | Add 1,5 g of NaCl to 1 l of semi-skimmed milk |
| Silage | Silage | Grass or corn silage of good quality (Reference [9]) |
| Sour | Fermented milk | Add 20 ml of non-fat fermented milk to 1 l semi-skimmed milk. Store in a refrigerator overnight |
| Soap | Soap | Non aromatized soap, grated (Reference [9]) |
| Soap (alternative) | (*E*)-2-undecenal | |
| Sulfur/eggy | Boiled egg | Mashed boiled egg (Reference [4]) |
| Tallow | Animal fat | Rendered animal fat |
| Vanilla | Vanilla pod | Add a split vanilla pod to milk, then heat and leave to cool while covered (Reference [9]) |
| Vanilla (alternative) | Vanillin/ethylvanillin | 0,2 mg/l water |
| Whey | Cheese | Fresh Cheddar whey (Reference [4]) or whey powder |
| Whey, acidified | Heated whey | Whey that has undergone heating in the vat at least equal to 37 °C and incubated at 40 °C for 24 h (Reference [9]) |
| Yeasty | Yeast | Raw yeast dough or yeast in 3 % mass fraction warm sucrose water (Reference [4]) |

NOTE Some concentrations have not been recommended, as concentrations for certain references may vary between products and countries.

[a] In older literature, known as *trans,trans*-deca-2,4-dienal.

## 9 Performance

Check the performance and consistency of the assessors regularly. The purpose of checking performance is to determine whether the assessor is reliable, consistent and able to reproduce results. Results can also be used to motivate assessors. Performance results determine whether more training is necessary.

The specific sensory tests and products to be used depend on the application area of the assessors. The screening tests outlined in 5.3 can be repeated using products and evaluation methods that the assessors normally use. These results can be monitored for each assessor on a regular basis. The results should be presented to and discussed with the assessors.

During the whole of the training process, the panel leader should note how panel members interact, whether there are any consistent outliers, the reliability of members and their general interest in the work. Panel members having problems in these areas should be encouraged to overcome their difficulties or be removed from the panel, if necessary.

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