TECHNICAL SPECIFICATION

**ISO/TS 17728**

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# Microbiology of the food chain — Sampling techniques for microbiological analysis of food and feed samples

*Microbiologie de la chaîne alimentaire — Techniques de prélèvement pour l'analyse microbiologique d'échantillons d'aliments*



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# Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary Information.

ISO/TS 17728 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO/TC 34, *Food products*, Subcommittee SC 9, *Microbiology*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).



 

# Introduction

Some information on sampling techniques given in this Technical Specification is intended as guidance only; other parts are mandatory.

For some aspects of sampling, agreements and/or contracts with laboratory clients are necessary to ensure the method and extent of sampling to meet their requirements.

# Microbiology of the food chain — Sampling techniques for microbiological analysis of food and feed samples

## 1 Scope

This Technical Specification applies to the collection of samples before submission to the laboratory for microbiological examination. It provides general instructions and specific requirements for obtaining samples and for transport to the laboratory.

Sampling plans are not included in the scope of this Technical Specification.

This Technical Specification applies to all food and feed products, including blocks of frozen products, carcasses (excluding surface sampling of carcasses), meat, and bulk products.

The following sample types are outside the scope of this Technical Specification:

— milk and dairy products (see ISO 707);

— surface sampling of carcasses (see ISO 17604);

— samples from environmental surfaces (see ISO 18593);

— samples from the primary production stage (see ISO 13307).

## 2 Normative references

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

ISO 7218, *Microbiology of food and animal feeding stuffs — General requirements and guidance for microbiological examinations*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7002 and the following apply.

### 3.1 Sampling

**3.1.1**
**sampling**
procedure used to draw and constitute a sample

[SOURCE: ISO 7002:1986, A.41]

**3.1.2**
**sampling plan**
predetermined procedure for the selection, withdrawal, and preparation of samples from a lot to yield the required information so that a decision can be made regarding the acceptance of the lot

[SOURCE: ISO 7002:1986, A.43]

**3.1.3**
**sampling technique**
procedure used to take the sample



 

**3.1.4**
**batch**
**lot**
identified quantity of some commodity, manufactured or produced under conditions that are presumed uniform

[SOURCE: ISO 7002:1986, A.21]

**3.1.5**
**lot size**
number of items or quantity of material constituting the lot

[SOURCE: ISO 7002:1986, A.22]

## 3.2 Samples

**3.2.1**
**item**
**individual**
**unit**
1) actual or conventional object (defined quantity of material) on which a set of observations may be made or 2) observed value, either qualitative or quantitative

[SOURCE: ISO 7002:1986, A.18]

**3.2.2**
**sample (general term)**
one or more items (or a proportion of material) selected in some manner from a population (or from a larger quantity of material) intended to provide information representative of the population, and possibly, to serve as a basis for a decision on the population or on the process which had produced it

[SOURCE: ISO 7002:1986, A.39]

Note 1 to entry: In food microbiology, each unit or item is often referred to as a sample when each unit is examined separately. In this Technical Specification, the units are referred to as laboratory samples. Once prepared, following the ISO 6887 series of standards (for example, with homogenization, mincing, grating, etc.), the laboratory sample becomes the test sample. From this test sample, one test portion is taken for examination.

**3.2.3**
**laboratory sample**
amount or units of product that arrives in the laboratory to be analysed

[SOURCE: ISO 7218:2007]

**3.2.4**
**representative sample**
sample drawn so as to reflect, as accurately as possible, the properties of interest of the lot (the bias of the sample should be a minimum against the lot) from which it is taken

[SOURCE: ISO 7002:1986, A.38]

**3.2.5**
**pooled sample**
mixed sample of a number of items of the same type of food, animal feed, animals, or environment where the complete mixture is the test portion and is taken as a whole for examination in the laboratory

**3.2.6**
**composite sample**
mixed sample of a number of items of the same type of food, animal feed, animals or environment, from which a test portion is taken for examination in the laboratory

**3.2.7**
**increment**
quantity of material taken at one time from a larger body of material

[SOURCE: ISO 7002:1986, A.14]

Note 1 to entry: Parts added to each other to form the pooled or composite sample.

**3.2.8**
**bulk sample**
1) collection of increments or groups thereof intended for separate investigation (raw bulk sample) or 2) composite of the increments taken from a bulk lot (bulk sample in a proper sense) or 3) combined aggregation of the items or portions of items taken from a lot of pre-packed products (bulked sample)

[SOURCE: ISO 7002:1986, A.5]

**3.2.9**
**test sample**
sample prepared from the laboratory sample according to the procedure specified in the method of test and from which test portions are taken

[SOURCE: ISO 7002:1986, A.47]

Note 1 to entry: Preparation of the laboratory sample before the test portion is taken is infrequently used in microbiological examinations.

**3.2.10**
**test portion**
measured (volume or mass) representative sample taken from the laboratory sample for use in the preparation of the initial suspension

[SOURCE: ISO 6887]

Note 1 to entry: Sometimes preparation of the laboratory sample (3.2.3) is required before the test portion is taken, but this is infrequently used in microbiological examinations.

## 3.3 Products

**3.3.1**
**bulk products**
products that are not separated into individual items or units

**3.3.2**
**packaged product**
products separated into units or items, sealed or wrapped by the manufacturer

**3.3.3**
**open products**
products in unpackaged units

## 3.4 Sample handling

**3.4.1**
**transport**
care and handling of the sample from when it was taken until arrival at the laboratory to ensure that microbiological integrity is maintained

**3.4.2**
**refrigeration**
**cold chain**
maintenance of samples at cold temperatures to minimize changes in microbial load

**3.4.3**
**receipt**
procedures adopted by the laboratory when the samples arrive

**3.4.4**
**acceptance criteria**
sample characteristics required upon arrival at the laboratory and before the acceptance for examination (e.g. size, weight, integrity of wrapping, correct temperature for physical state, etc.)

## 4 Principles and general requirements

Representative samples shall be taken when sampling all products.

Sampling techniques shall not modify the intrinsic microbial flora of the product (such as via contamination from sampling implements or the environment or death/growth of this microbial flora during transport to the laboratory).

Before sampling, the minimum quantity required for examination and any instructions on pooling or compositing on site shall be agreed with the client.

Other necessary details should also be agreed with the client before sampling to ensure the correct interpretation of test results. For example:

— what kind of product and which batches are to be sampled;

— the purpose of testing (monitoring the production or examination of a particular batch, checking the microbiological quality of the product or quality of the product as presented to the consumers);

— protective clothing required for samplers (for example, in accordance with factory safety requirements);

— whether sterile or clean, but non-sterile sampling implements are to be used.

Criteria for sample acceptance and any permitted deviations on receipt at the laboratory shall be defined (in accordance with client requirements).

Unique identification of samples and labelling requirements shall be defined.

Sufficient information shall be recorded in the sampling report to give full traceability of the samples and allow interpretation of the results of analysis.

It is important to cause minimum disruption at the sampling site and follow any security instructions.

All samples shall be handled, packaged, and transported to the laboratory in such a way so as to prevent compromising the identity or integrity of the sample.

Sample handling procedures, including transport, shall not affect the microbiological quality of the samples in any way. In all cases, it is important to retain the original microbiological quality of the product. Samples which were not frozen before sampling shall not be frozen after sampling (see ISO 7218). Freezing samples can affect the viability of the intrinsic microbial flora and lead to false negatives in pathogen testing and reduced counts in quantitative methods.

Exceptionally, if freezing of samples is necessary due to high ambient temperatures or protracted transport times, this shall first be agreed with the client and also recorded by the laboratory.

## 5 Sampling plan

When sampling bulk products, locations for taking the increments (and the sampling techniques) shall be included in the sampling plan. All interested parties shall agree upon the sampling plan to be used

and on the size of increments taken if samples are to be composited or pooled before testing. Further information about sampling plans is available in the ISO 2859 series.

# 6 Personnel

## 6.1 General arrangements

The parties concerned, or their representatives, shall be given the opportunity to be present when sampling is performed.

Whenever special requirements are given for the sampling and/or are necessary for specific testing, these requirements shall be followed.

## 6.2 Sampling personnel (samplers)

Sampling for microbiological examination shall always be undertaken by personnel trained and experienced in the techniques of sampling for microbiological purposes.

All sampling personnel shall have training in aseptic techniques and experience with the types of products being sampled. They should also be aware of the requirement to minimize changes in the normal microbial flora of the products during sampling and transport.

# 7 Sampling techniques

## 7.1 Equipment

Some or all of the following equipment may be necessary for sampling food and feed from different environments.

Equipment and the implements used to take the samples shall be clean, as a minimum and sterile where required, depending on the aim of testing. For example, if testing is to check the intrinsic microbial flora of the product, then the equipment shall be sterile; if testing is to check the hygienic conditions of catering or of food manufacturing, then use the catering equipment or the equipment that is used by the food manufacturer.

Similarly, the packaging for samples may or may not be sterile depending on the purpose of the testing.

**7.1.1 Materials for decontamination** of packaging, instruments, and surfaces of certain samples:

— ethanol 70 % v/v or other bactericidal agents;

— wipes or pads impregnated with alcohol or other bactericidal agents.

**7.1.2 Plastic bags** of appropriate size, grade, and capacity suitable for containing the samples, sterile or not, depending on the sample and purpose of testing; if possible, with waterproof labels.

**7.1.3 Boxes,** egg boxes or other containers for fragile samples, sterile or not, depending on the sample and purpose of testing.

**7.1.4 Bottles or tubes,** of appropriate materials and capacities to contain liquid samples, sterile or not, depending on the sample and purpose of testing. These are useful for spoiled samples, especially if they have wide openings.

**7.1.5 Thermometers,** electronic and surface probes, infrared probes, calibrated.

**7.1.6 Labelling systems** (labels, permanent ink pens, etc.).

**7.1.8 Spoons, forceps, knives, scalpels, dip samplers, ladles,** and other implements for specific applications (e.g. oyster knives, implements for burrowing bivalves, syringes, pipettes, probes, etc.), sterile or not, depending on the sample and purpose of testing.

**7.1.9 Electric or hand drill with suitable bits or corer** for frozen products, sterile or not, depending on the sample and purpose of testing.

**7.1.10 Band saw or core sampler for certain products** (e.g. meat and cheese), sterile or not, depending on the sample and purpose of testing.

**7.1.11 Protective clothing for samplers** (if required in the sampling premises and as discussed with the client), for example, coat, hat, shoes, gloves, and strong gloves suitable to protect operator from injury when sampling shellfish, etc.

## 7.2 Sampling techniques: General protocol

Sampling large products may be carried out at the factory or these can be transported to the laboratory. The procedure used to prepare the test portion may be the same (see the ISO 6887 series for details).

In some cases, an additional sample may be taken for temperature recording during transport or upon receipt at the laboratory.

Hot, ambient, chilled, or frozen products shall not be included in the same transport container.

Procedures for taking samples are described by product group below.

### 7.2.1 Bulk products (liquids, solids, powders, granules, etc.)

**Description**

— liquid products;

— powdered or granular products (flour, seeds);

— solid products (may be frozen).

**Specific equipment**

— spoons, spatulas, ladles (7.1.8), specific drills (7.1.9), and bags or boxes for solid products (7.1.2 and 7.1.3);

— syringes, pipettes, probes (7.1.8), and bottles for liquid products (7.1.4).



 

**Specific procedure**

Label the container (7.1.6). Take a portion of the product with an appropriate implement (7.1.8) and place in a bag or box if solid (7.1.2 and 7.1.3), or in a bottle or tube if liquid (7.1.4), and close the container securely to prevent leakage.

Put the container in a cool box, refrigerator (10.1) or insulated box as appropriate to the state of the sample.

NOTE For some bulk products, the requirements to take incremental samples may be given in regulations or specific standards.

### 7.2.2 Packaged products (refrigerated, frozen, or ambient)

**Description**

The product is packaged, wrapped, or sealed in the place where sampling is carried out (e.g. factory, store, restaurant, etc.).

For refrigerated products, see 7.2.3, for frozen products, see 7.2.4, and for ambient products, see 7.2.6.

**Specific equipment**

No specific equipment.

**Specific procedure**

Take the packaged product without damaging the wrapping. Put it in a bag or a box if necessary (7.1.2 and 7.1.3), label the container (7.1.6), and put the container in a cool box, refrigerator, or insulated box (10.1) as appropriate to the state of the sample.

### 7.2.3 Refrigerated products

**Description**

Products kept at a temperature of 2 °C to 8 °C.

**Specific equipment and procedure**

Take samples of refrigerated products quickly to avoid temperature increases. Use procedures and equipment described above as appropriate to the type of product.

For packaged products, see 7.2.2.

For non-packaged (open) products, see 7.2.1.

### 7.2.4 Separated frozen products

**Description**

Products kept in a frozen state (generally, below –15 °C and preferably, below –18 °C; see ISO 7218).

**Specific equipment and procedure**

Take samples of frozen products quickly to avoid temperature increases. Use procedures and equipment described above as appropriate to the type of product.

For packaged products, see 7.2.2.

For non-packaged (open) products, see 7.2.1.

### 7.2.5 Blocks of frozen products (e.g. meat or fish)

**Description**

Large blocks of frozen products are an intermediate case between packaged unit products and bulk product.

The blocks may be sampled in the factory or transported to the laboratory in the frozen state.

**Specific equipment**

— electric or hand drill with suitable bits or corer (7.1.9);

— spatula or spoon to collect shavings generated by drilling (7.1.8);

— bags or boxes (7.1.2 and 7.1.3).

**Specific procedure**

Using an electric drill with an appropriately sized bit or other implement or the hand drill (7.1.9), make holes at the specified points (see Annex B). Set the speed of the electric drill or other implement at approximately 900 r/min to avoid fusion by heating or dispersal of the shavings.

Use a spatula or spoon (7.1.8) to collect the resultant shavings and place them in the container or bag (7.1.2 and 7.1.3).

### 7.2.6 Ambient products

**Description**

Products kept at room temperature (18 °C to 27 °C) (see ISO 7218).

**Specific equipment and procedure**

No specific requirements.

For packaged products, see 7.2.2.

For non-packaged (open) products, see 7.2.1.

### 7.2.7 Hot products

**Description**

Prepared products ready for consumption (e.g. cooked products during preparation, prepared hamburger, heated ready-to-eat products, etc.).

**Specific equipment**

All implements (spoons, ladles) (7.1.8) and containers (boxes or bags) (7.1.2 and 7.1.3) shall be made of heat-resistant materials.

**Specific procedure**

Product in the preparation kitchen (see 7.2.1).

Packaged product (see 7.2.2).

Consumer portion (see 7.2.8).

Take a portion of the product with an appropriate implement (7.1.8) and put it in a bag or a box if solid (7.1.2 and 7.1.3), or in a bottle if liquid (7.1.4), and close the container securely to prevent leakage. Label the container.

Hot products shall not be included in the same transport container as ambient, chilled, or frozen products.



 

#### 7.2.8 Consumer portions in restaurants

**Description**

Prepared products just before service; the portions may or may not be packaged.

**Specific equipment**

— implements such as spoons, spatulas, and ladles (7.1.8);

— bags or boxes (7.1.2 and 7.1.3).

**Specific procedure**

Take a portion of the product with an appropriate implement (7.1.8) and put it in a bag or a box if solid (7.1.2 and 7.1.3), or in a bottle if liquid (7.1.4), and close the container securely to prevent leakage. Label the container.

Put the container in a cool box, refrigerator, or insulated box as appropriate to the state of the sample.

For consumer portions served on a plate, slide the product into a suitable sample bag (7.1.2). If necessary, use an appropriate implement (7.1.8) or the wall of the bag to take the entire portion.

A sample bag may be used to remove the product by inverting it over the hand and then inverting the bag again over the product inside.

For packaged products, see 7.2.2.

### 7.3 Sampling techniques for specific products

#### 7.3.1 Live shellfish (bivalve molluscs, gastropods, echinoderms, and tunicates)

**Description**

Any marine or freshwater bivalve filter-feeding molluscs, including other species such as echinoderms, tunicates, and gastropods.

**Specific equipment**

— equipment normally used in harvesting areas [strong gloves (7.1.11), oyster knives, and implements for burrowing bivalves (7.1.8)];

— insulated box with cold packs and temperature probes (10.1.2).

**Specific procedure**

The species under examination should be sampled using the method employed for commercial harvesting. To avoid contamination by microorganisms adhering to marine sediments, disturbance of surrounding sediments shall be avoided. Once removed from the water and only when closed, the shellfish should be cleaned by rinsing or scrubbing with clean seawater or fresh potable water. Shellfish shall not be re-immersed in water (see Reference [6]).

Samples should comprise of individuals within the normal commercial size range.

A minimum of 10 live individuals should be taken for laboratory testing. The number of live individuals should be sufficient to provide a minimum of 50 g of flesh and intravalvular liquid (see ISO 6887-3 for the recommended number of individuals for some species). Additional animals shall be collected to allow for a proportion of individuals received at the laboratory to be in a moribund state.

Place each sample in a separate intact plastic bag (7.1.2) with a waterproof label (7.1.6) in a cool box with cold packs or refrigerator (10.1.2) as appropriate to the state of the sample. This bag may be placed inside a second bag to help prevent leakage.

Do not place samples in direct contact with the cold packs (10.1.1) or freeze them as testing of live shellfish is required.

### 7.3.2 Fruits and vegetables, spices and herbs, coffee, tea, etc.

Use equipment and a procedure appropriate to the physical presentation of the product (powders, liquids, small solids, packaged or loose, etc.).

### 7.3.3 Whole eggs

Take only unbroken eggs and carefully place them into egg boxes or other boxes (7.1.3) suitable for fragile products to avoid breakage during transport.

### 7.3.4 Canned food

See packaged products (7.2.2).

### 7.3.5 Feeds

Adapt the equipment and the procedure to the physical state of the product (powders, liquids, small solids, packaged or loose, etc.).

### 7.3.6 Special cases, e.g. neck skin of poultry or carcass rinses

Not included in the scope of this Technical Specification (see ISO 17604).

### 7.3.7 Spoiled samples

**Description**

The purpose of sampling and examination of spoiled products is to ascertain the cause of spoilage.

Many kinds of products are subject to microbial spoilage (for example, blown cans or aseptic packs). Hence, it is important to maintain the integrity of all spoiled products until the laboratory examination begins.

**Specific equipment**

No specific equipment is required.

Pack the samples in strong materials to contain any leakage and prevent further damage [e.g. boxes or bags (7.1.2 and 7.1.3)].

**Specific procedure**

Prevent cross-contamination of other samples and potential hazards to personnel, e.g. from blown cans or aseptically packaged products which contain gas under pressure, by double wrapping if necessary.

NOTE If spoilage of cans or other commercially sterile packs by thermophilic microorganisms is suspected, do not refrigerate or freeze the samples.

### 7.3.8 Sampling with automatic apparatus

**Description**

In some production situations, samples are taken directly from the production line automatically at specified time intervals. Such samples shall be collected, contained, and labelled in a suitable manner.



 

## 8 Packing and labelling of samples

Immediately after collection, sample bottles, bags, or boxes shall be placed in a protective container at an appropriate temperature such as a cool box containing cold packs.

Samples shall be packed in order to avoid cross-contamination and to prevent leakage or loss/gain of moisture.

Samples shall be clearly identified with all the necessary details (e.g. batch or other identification code).

Samples shall be packed with shock-absorbing materials to protect against breakage of containers or damage to shipping seals. Shipping seals are sometimes required by the client to demonstrate that samples have not been tampered during sampling and testing.

It is essential that samples are not placed in direct contact with frozen surfaces, such as ice packs, as this may affect the intrinsic microbial flora.

## 9 Preparation of a sampling form (sampling report)

Samples shall be accompanied by a report ideally completed on a standard form provided by the laboratory, which has been signed or initialled by the sampling personnel. The report shall give the following particulars:

a) place, date, and time of sampling;

b) nature, number, and identity of samples constituting the consignment;

c) purpose of sampling and the microorganisms to be sought.

When appropriate, the sampling report shall also include any relevant conditions or circumstances and any special information relating to the product being sampled, for example, difficulty in achieving representative samples.

In addition to the sampling report, the following details shall be recorded and sent to the laboratory to identify the samples on receipt:

— type and name of product;

— description of sample;

— number of samples submitted;

— name of the owner and address where the samples were taken;

— place of sampling or collection;

— batch number or any other identification of the product;

— date and time of sampling;

— names of the sampling personnel;

— temperature of sample and storage;

— testing required.

## 10 Transport

See ISO 7218.

Some regulations exist for transporting contaminated or hazardous materials, such as cultures of pathogenic bacteria, but these do not generally apply to food samples.

Transport time to the laboratory shall be as short as possible and should be no more than 24 h and shall be in controlled temperature conditions to ensure maintenance of sample integrity. All necessary steps shall be taken to avoid changes to the intrinsic microbial flora and these shall be documented.

Hot products shall not be included in the same transport container as ambient, chilled, or frozen products. Transport chilled products at below 8 °C and frozen products at below –15 °C.

The temperature of samples of live shellfish should be recorded immediately after collection. Transit temperature shall be between 0 °C and 10 °C and the equipment used shall be capable of achieving this temperature range within 4 h of sample packing and maintaining it for at least 24 h. If cold packs are used, samples shall not come into direct contact with their surfaces. Samples shall not be frozen (see ISO 6887-3).

A calibrated data recorder may be placed between the samples.

## 10.1 Apparatus and equipment

### 10.1.1 Refrigerators, freezers, cool boxes, boxes or containers, cold packs

— **Refrigerated vehicles**

Purpose-built vehicles equipped with a refrigeration unit to maintain the storage area below 8 °C and monitor temperatures during transport.

— **Vehicle refrigerator**

Portable refrigerator for use in a vehicle to keep refrigerated samples below 8 °C. The refrigerator may be equipped with an integral battery or function from the vehicle battery.

— **Vehicle freezer**

Portable freezer for use in a vehicle to keep frozen samples at –15 °C or below. The freezer may be equipped with an integral battery or function from the vehicle battery.

— **Cool box**

Insulated container equipped with cold packs. The cool box shall maintain the temperature at –15 °C or below for frozen products or below 8 °C for chilled products.

— **Boxes and containers,** cardboard, polystyrene, or other plastic as appropriate.

— **Cold packs,** purpose-made packs which are frozen before use to maintain low temperatures when placed in sample transport containers.

### 10.1.2 Temperature-monitoring equipment

Thermometers, temperature probes, temperature recorders, and integrated temperature recorders (battery-operated with associated software for programming the recorder and downloading the temperature records).

All devices shall be calibrated and capable of recording temperatures from –20 °C to +10 °C with a measurement uncertainty of ±1 °C. They should be waterproof to avoid damage.

## 10.2 Transport protocol

When sampling is organized by the laboratory, samples may be transported by laboratory personnel using laboratory equipment or by a specific transport organization (subcontractor).

In other cases, transport conditions are the responsibility of the sampler and/or client after discussion of suitable transport and delivery methods for the sample types with the laboratory.

In the transport protocol, critical factors such as the following shall be considered:

— duration of the journey;

— nature of the samples (see below), temperature, and method of recording the temperature (i.e. before and after or throughout transport);

— packaging and secondary containment to protect sample integrity;

— arrangement in the transport boxes or other equipment to prevent mixing of frozen, refrigerated, and hot products.

An additional sample labelled accordingly may be required for temperature recording during transportation or on receipt.

Some highly perishable samples and others (e.g. swabs and process water samples) may be adversely affected by protracted transport times greater than 24 h and such effects shall first be verified.

For bivalve molluscs, gastropods, echinoderms, and tunicates, transport temperature shall be between 0 °C and 10 °C. Samples shall not be frozen.

### 10.2.1 Transport by the laboratory

Immediately after collection, sample bottles, bags, or boxes shall be placed in a protective container at an appropriate temperature, such as a cool box containing cold packs.

It is essential that samples, other than those already frozen, do not come into direct contact with frozen surfaces as this may affect the intrinsic microbial flora. If the laboratory vehicle is refrigerated or it is equipped with a portable refrigeration unit, the samples may be transferred from the portable container used for sampling. The refrigeration unit shall be switched on long enough before use to ensure the required temperature is achieved.

If the vehicle is not refrigerated, a cool box shall be available in the vehicle and shaded from direct sunlight to minimize heat gain during transport.

The temperature range permitted during transport and the maximum duration of transport shall be documented in the client contract. The permitted temperature range will depend on the food type (ambient, refrigerated, frozen, or hot product) and should be related to the transport duration, for example, >2 °C to ≤8 °C for chilled samples over longer transport times or >8 °C to <10 °C for shorter transport times of less than 4 h.

The vehicle refrigerator or cool box should include a thermometer or a temperature recorder. If not, the temperature of the products or cool box should be recorded each time the cool box is opened and upon final receipt at the laboratory.

If a temperature recorder is used, the monitoring should be placed in contact with the sample when possible.

Some ambient-stable products do not require refrigerated transport (e.g. powdered products, cans, etc.); however, in high ambient temperatures, it may be useful to record the vehicle and/or container temperature to check that excessively high temperatures (e.g. >40 °C) have not affected the samples.

### 10.2.2 Transport by a contractor or courier

When laboratory transport cannot be used (e.g. for long distances), a haulage contractor or courier, preferably using refrigerated vehicles, may be used. Conditions for transporting the samples shall be carefully documented and agreed before the contract is placed.

Put the samples in a container (strong box or a cool box if required). A temperature recorder should be used as described in 10.2.1 to check the maximum temperature reached during transportation. If this is not possible, record the temperature inside the container just before closing and ensure it is recorded again just after arrival at the laboratory to ensure maximum permitted temperature has not



 