SIRIM STANDARD

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Healthy purification of refrigerating appliances for household and similar use

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Foreword

This SIRIM Standard was developed by the Project Committee on Healthy Purification of Refrigerating Appliances for Household and Similar Use established by SIRIM Berhad.

This standard was developed with the following objectives:

a) to provide a standard that prescribes the requirements and test methods to establish a healthy purification of household refrigerating appliances and similar use; and

b) to determine the rating and evaluation criteria for healthy purification of household refrigerating appliances and similar use.

Information to assist users of the standard

For the purpose of this standard, the following ISO definitions have been adopted regarding verbal forms for the expression of provisions:

a) **“shall”** indicates an auditable **requirement**: it is used to indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted;

b) **“should”** indicates a **recommendation**: it is used to indicate that among several possibilities one is recommended as particularly suitable without mentioning or excluding others, or that certain course of action is preferred but not necessarily required, or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited;

c) **“may”** indicates a **permission**: it is used to indicate a course of action is permissible within the limits of the document; and

d) **“can”** indicates a **possibility** or a **capability**: it is used for statements of possibility and capability, whether material, physical or causal.

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Healthy purification of refrigerating appliances for household and similar use

1. Scope

This standard prescribes the requirements and test methods to establish a healthy purification of household refrigerating appliances and similar use. Appliances not intended for normal household use, such as appliances intended to be used in shops, offices, hospitality and in light industry, are also within the scope of this standard.

2. Normative references

The following documents are essential for the application of this document. For references dated, only the dated versions apply. For references undated, the latest versions (including all amendments) apply.

ISO 22196, *Measurement of antibacterial activity on plastics and other non-porous surfaces*

IEC PAS 60386-3-1, *Household and similar electrical air cleaning appliances - Methods for measuring the performance - Part 3-1: Method for assessing the reduction rate of key bioaerosols by portable air cleaners using an aerobiology test chamber*

ASTM G21, *Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi*

3. Terms and definitions

The following terms and definitions apply to this document.

3.1 deodorisation

Purification process that reduces or removes odoriferous chemical gases resulting in olfactory discomfort.

3.2 deodorisation rate

Value of the reduction in the concentration of chemical gases leading to olfactory discomfort in the deodorisation test, which is expressed as a percentage.

3.3 antibacterial

Process of using chemical, physical and/or radiation methods to inhibit the growth and reproduction of bacteria.

3.4 antibacterial materials

Substances that inhibit the growth and reproduction of bacteria.

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3.5 antibacterial rate

Value of depletion in bacteria numbers expressed by a percentage in antibacterial tests.

3.6 bacterial elimination

Process of removing or reducing bacteria from the target through chemical, physical, or other methods.

3.7 air disinfection

Process of eliminating bacteria from the air circulating inside the refrigerator volume, which include the chilled or freezing compartment or a specific compartment, using chemical, physical, radiation and/or other suitable methods.

3.8 surface disinfection

Process of eliminating bacteria from the internal surfaces of the refrigerator through chemical, physical, radiation and/or other suitable methods.

3.9 eliminating bacterial rate

The ratio, expressed as a percentage, of the difference between the total number of colonies before and after disinfection to the initial value.

3.10 mould prevention

Process of using chemical, physical, radiation and/or other suitable methods to inhibit the growth and reproduction of mould.

3.11 mould prevention grade

Mould-proof effect expressed by mould growth grade in the anti-mould test.

4. General requirements

4.1 Only competent personnel in microbiological techniques and chemical analysis shall carry out tests according to this standard.

4.2 Appropriate precautionary measures shall be taken to avoid adverse effects to the safety, health and environment as recommended by the Safety Data Sheet (SDS) of the materials and chemicals used for the tests in this standard.

4.3 Additional requirements may be necessary for appliances intended to be used in any other environment, which are not covered in this standard.

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5. Test method

5.1 General test conditions

Other than the tests in which specific provisions are made for the environmental conditions, all tests shall be carried out in an enclosed room with an ambient temperature of (25 ± 2) °C, and free from external airflow that could affect the results.

The test power supply shall be 230/400 V with a range of +10 % and -6 % at a frequency of 50 Hz with a range of ± 1 %.

5.2 Leakage of hazardous substances

The test for leakage of hazardous substances shall be carried out prior to the subsequent tests.

5.2.1 When the harmful factors emitted by the purification and sterilisation device in the refrigerating appliance are tested, the test result value shall be corrected by deducting the indoor test value with the background concentration value in the indoor environment.

The test shall not commence until the appliance is put into operation for at least 30 min.

5.2.2 Ozone concentration

Where the appliance door is closed, measure the ozone concentration with an ozone analyser at a distance of 5 cm from the center point of each door gap. The average of the ozone concentration results shall comply to Table 1.

The accuracy of the ozone analyser shall be within ± 10 %.

5.2.3 Ultraviolet intensity

During the ultraviolet intensity test, it is necessary to place the appliance in a black darkroom. Where the appliance door is closed, measure the ultraviolet intensity with an ultraviolet irradiance meter at a distance of 5 cm from the center point of each door gap. The average UV concentration results shall comply to Table 1.

The ultraviolet irradiance meter shall measure at a wavelength of 254 nm, with an accuracy of ± 0.1 μW/cm^2.

Table 1. Requirements on leakage of hazardous substances

Hazardous substance	Indicator
Ozone concentration	⩽ 0.10 mg/m^3
Ultraviolet intensity	⩽ 5 μW/cm^2

5.3 Deodorisation rate

The test shall be carried out subject to the method set out in Annex A.

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5.4 Antibacterial rate

5.4.1 Test method for antibacterial performance on plastics and other non-porous surfaces shall be carried out subject to the method set out in Annex B.1.

5.4.2 Test method for antibacterial performance on porous surfaces used for absorbent materials such as non-woven fabrics, textiles, porous materials, foam, etc. that have antibacterial properties shall be carried out subject to the method set out in Annex B.2.

5.5 Bacterial elimination rate for air

The test shall be carried out subject to the method set out in Annex C.1.

5.6 Bacterial elimination rate for surface

The test shall be carried out subject to the method set out in Annex C.2.

5.7 Mould prevention

The test shall be carried out subject to the method set out in Annex D.

6. Rating and evaluation criteria for healthy purification

6.1 Products are classified into three rates: A, A+, and A++.

Evaluation is based on the following criteria: deodorisation rate, antibacterial rate, bacterial elimination rate for air, bacterial elimination rate for surface and mould prevention grade.

The requirements for the specific criteria are assessed as outlined in Table 2.

Table 2. Rating and evaluation criteria for healthy purification

Health purification rate	Evaluation criteria				
	Deodorisation rate	Antibacterial rate	Bacterial elimination rate for air	Bacterial elimination rate for surface	Mould prevention grade
A	≥60 %	≥90 %	NA	NA	Grade ≤1
A+	≥90 %	≥99 %	≥90 %	NA	Grade 0
A++	≥90 %	≥99 %	≥90 %	≥99 %	Grade 0

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6.2 Based on Table 2, the evaluation shall be made with the components or functional modules that are equipped in the refrigerating appliances, as follows:

a) Level A health purification products shall be equipped with antibacterial and mould prevention components or modules and a deodorisation functional module.

b) Level A+ health purification products shall be equipped with antibacterial and mould prevention components or functional modules, deodorisation and air bacterial elimination functional modules.

c) Level A++ health purification products shall be equipped with antibacterial and mould prevention components or functional modules, deodorisation and air bacterial elimination functional modules, and surface bacterial elimination functional modules.

The above functionalities can be achieved through one or multiple modules and components.

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Annex A
(normative)

Test method for deodorisation performance

A.1 Principle

A certain concentration of chemical gases is introduced into a standard volume experimental box. The refrigerator deodorisation unit is placed in the experimental box and run for a specified time. The deodorisation rate is calculated by measuring the change in chemical gas concentration before and after operation.

A.2 Materials

a) **Trimethylamine standard gas**, ≥ 99.5 %

b) **Methyl mercaptan standard gas,** 98.0 %.

A.3 Apparatus

i) **Gas Chromatography**

- Gas Chromatography – Flame Ionisation Detector (GC-FID)
- Gas Chromatography – Mass Spectrometry (GC-MS)

ii) **Column**

- DB-5ms (123-5563) 60 m x 0.32 mm, 1.00 μm for Methyl Mercaptan determination
- DB-1 (125-1035) 30 m x 0.53 mm, 5.00 μm for Trimethylamine determination

iii) **Flowmeter**, 1 – 50 mL/min.

iv) **Sampling pump**. 1 – 50 mL/min.

v) **Acrylic sealed airtight experimental glove box,** inner diameter of 450 mm x 450 mm x 495 mm, 100 L capacity with gloves installed.

vi) **Deodorisation unit**.

vii) **Fan**, air flow at (0.014 ± 3) m^3/s, axial flow fan, install inside at the bottom centre of the acrylic sealed experimental box.

viii) **Impinger,** 100 – 200 mL.

ix) **High-pressure valve**.

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A.4 Procedure

A.4.1 Setup the experimental box as shown in Figure A.1. Fill the impinger with 100 mL of deionised water as a absorption media for the standard gas.

A.4.2 Place the deodorisation unit in the experimental box as shown in Figure A.1 and cover the unit with an acrylic cover. Make sure the experimental box is free from any gas that could potentially contaminate the box before the deodorisation unit is placed.

A.4.3 Open the inlet valve and close the valve for the outlet. Turn on the regulator to allow the standard gas to enter the pipeline.

A.4.4 Adjust the flow rate using the flowmeter at 1 mL/min. Let the gas enter the experimental box for 55 to 60 sec and then close the inlet valve immediately. The gas concentration inside the experimental box shall be within 8 ppm to 10 ppm.

A.4.5 Switch on the fan to evenly homogenise the gas in the box.

A.4.6 After 3 min, open the outlet valve and turn on the sampling pump. Set the sampling pump flow rate at 20 mL/min. Allow the gas in the experimental box to pass through the impinger exactly for 5 min (total volume of air sampled is 100 mL).

Suitable precautions should be taken to avoid gas concentration loss.

A.4.7 After 5 min, turn off the sampling pump and close the outlet valve. Take the absorption media inside the impinger and analyse it quantitatively using gas chromatography or other suitable instruments. The approximate final concentration in the absorption media is 80 - 100 ppm, C_1.

NOTE. The calculation is based on 98 % - 99.5 % standard gas concentration, 1 atm pressure and standard room temperature.

A.4.8 Open the acrylic cover using gloves to ensure that the deodorisation unit is in contact with the gas. Switch on the deodorisation module and operate it for 2 h.

A.4.9 After completion, measure the residual odour gas concentration using the similar technique used in A.4.7. Record the concentration after the test, C_2. The result is expected to be 90 % reduction of the initial gas concentration.

A.4.10 After the test completed, open the door for ventilation and wipe the interior walls of the test box with distilled water. The test shall be done in triplicates for each standard gas with relative standard deviation (RSD) within 5 % and the arithmetic average of the three test results shall be taken as the final test result.

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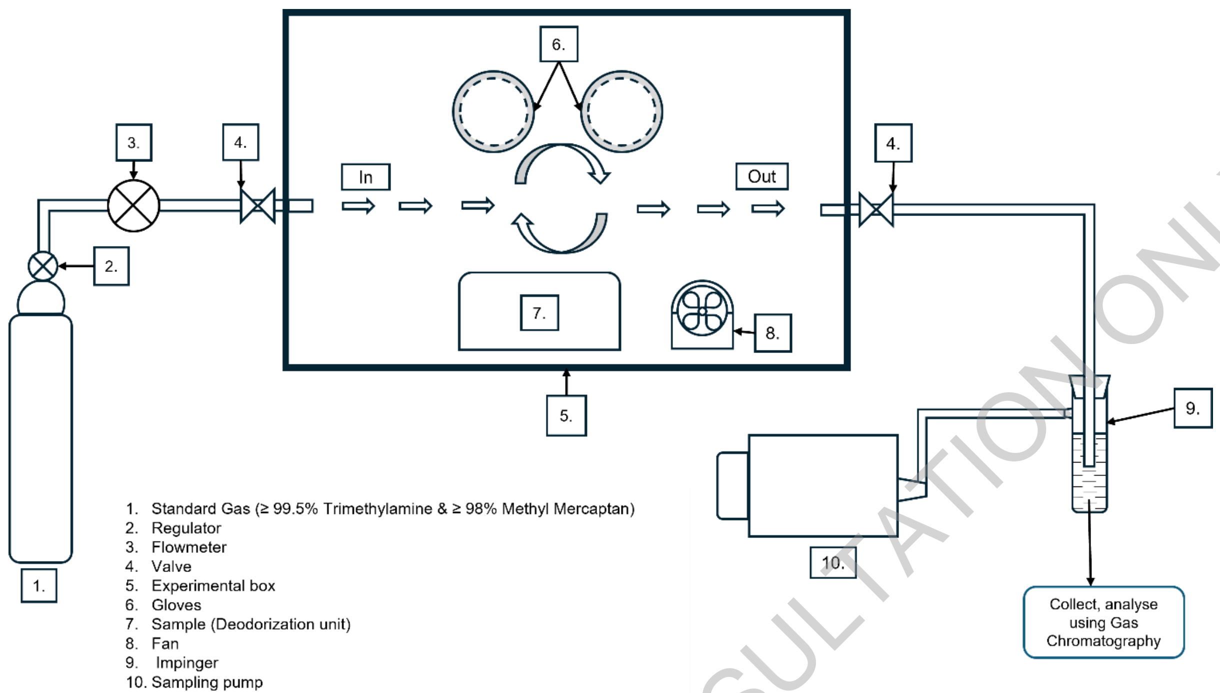

Figure A.1. Experimental box setup

A.5 Expression of results

A.5.1 The deodorisation rate is calculated according to Formula (1):

$$D_r = 1 = \frac{C_2}{C_1} \times 100\ \% \quad \text{.............................(1)}$$

Where

D_r , deodorisation rate, expressed as a percentage (%);

C_1 , initial gas concentration before the test, measured in ppm; and

C_2 , gas concentration after the test, measured in ppm.

A.5.2 The lower value of the D_r for both standard gases shall be used for the grading of the healthy purification.

A.5.3 The final test result should clearly indicate the selected gas name.

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Annex B
(normative)

Test method for antibacterial performance

B.1 Test method for antibacterial performance on plastics and other non-porous surfaces

B.1.1 The test method shall be referred to ISO 22196.

B.1.2 Expression of results

Antibacterial activity log reduction is converted to percentage reduction according to Formula (2):

Percentage reduction % = $100 \times (1-10^{-R})$ ……………………….(2)

Wherein:

R, the antibacterial activity expressed in log.

B.1.2.1 The results for both bacterial strains shall comply to the requirements set in Table 2.

B.2 Test method for antibacterial performance on porous surfaces

B.2.1 Principle

The tests sample and control sample are inoculated with test bacteria. After 24 h incubation, the remaining live bacteria is eluted and the antibacterial rate of the two groups of sample is calculated by counting viable bacteria.

B.2.2 Bacterial strains, reagents and culture media

B.2.2.1 Bacterial strains

a) ***Staphylococcus aureus***, ATCC 6538P.

b) ***Escherichia coli***, ATCC 8739.

B.2.2.2 Reagents

a) **NaCl solution (physiological saline)**, 0.85 %.

b) **Phosphate buffer (PBS)**, 0.03 mol/L, pH 7.2 to 7.4.

B.2.2.3 Culture media

a) **Nutrient broth medium (NB)**, biochemical reagent.

b) **Nutrient agar medium (NA)**, biochemical reagent.

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B.2.3 Apparatus

a) **Biochemical incubator**, temperature control accuracy of ±1 °C.

b) **Refrigerator**, temperature of 5 °C to 10 °C.

c) **Biosafety cabinet**, Class II A2.

d) **Electrically heated drying oven**, ambient temperature up to 200 °C.

e) **Autoclave**, capable of maintaining a temperature of (121 ± 2) °C and a pressure of (103 ± 5) kPa.

f) **Autoclavable screw-cap bottle or jar**, 250 mL capacity.

g) **Petri dish**, sterile, 90 mm to diameter.

h) **Test tube**.

i) **Pipette**, an accuracy of 0.01 mL capacity.

j) **Inoculating loop**.

k) **Orbital shaker**, 200 RPM capability.

B.2.4 Preparation of test

B.2.4.1 Test sample

Cut directly from the test sample that has undergone antibacterial treatment.

B.2.4.2 Control sample

Cut directly from the ordinary polypropylene non-woven fabric with a weight of 50 g/m2.

B.2.4.3 The dimension of test sample and the control sample are determined by sample material type. Generally, the round samples with a diameter of (50 ± 2) mm are used.

B.2.4.4 Sterilisation of items/media

Sample sterilisation methods according to different parts of material, can choose high pressure steam sterilisation, clearance of steam sterilisation or other sterilisation methods, but shall not affect its antibacterial properties and interfere with the test results, and indicate the disinfection method used in the report. Other apparatus are used in the experiment by adopting the method of high temperature (hot and humid or dry heat) sterilisation.

B.2.4.5 Preparation of Nutrient Broth Medium (NB)

a) **Beef extract**, 3.0 g.
b) **Peptone**, 10.0 g.
c) **Sodium chloride**, 5.0 g.

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Dissolve the above components in 1 000 mL distilled water, heat to dissolve, adjust the pH after sterilisation to 7.0 to 7.2 with 0.1 mol/L NaOH solution, divide, and sterilise at 121 °C in an autoclave for 15 min.

If a commercial medium is used, prepare and sterilise according to the product's specified method and conditions.

B.2.4.6 Preparation of Nutrient Agar Medium (NA)

a) **Beef extract**, 3.0 g.
b) **Peptone**, 10.0 g.
c) **Sodium chloride**, 5.0 g.
d) **Agar**, 15.0 g.

Dissolve the above components in 1 000 mL distilled water, heat to dissolve, adjust the pH after sterilisation to 7.0 to 7.2 with 0.1 mol/L NaOH solution. Add agar, dissolve, and sterilise at 121 °C in an autoclave for 15 min.

If a commercial medium is used, prepare and sterilise according to the product's specified method and conditions.

B.2.4.7 Pre-culturing of bacteria

Inoculate the preserved bacterial strain into NB using an inoculation loop, and incubate at (37 ± 1) °C for (24 ± 2) h.

B.2.4.8 Preparation of bacterial suspension

Prepare the bacteria suspension in B.2.4.7 using physiological saline to a concentration of 5 x10^5 CFU/mL to 10 x 10^5 CFU/mL.

If the sample has poor water absorption, add sterile Triton X-100 solution to a final of 0.05 % concentration to the test bacterial suspension.

B.2.4.9 Preparation of phosphate buffer

i) **Disodium hydrogen phosphate**, **anhydrous**, 2.83 g.

ii) **Potassium dihydrogen phosphate**,1.36 g.

Dissolve the component to 1 000 mL distilled water. Adjust the pH between 7.0 and 7.2 with 0.1 mol/L NaOH solution or 0.1 mol/L HCl solution. Sterilise in an autoclave at 121 °C for 15 min.

B.2.5 Procedure

B.2.5.1 Test sample

Put the sterilised test samples and control samples respectively in 250 mL sterile screw-cap bottle or jar. Perform the experiment for each group of samples in triplicate.

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B.2.5.2 Inoculation

Aspirate the bacterial suspension (1.0 ± 0.1) mL prepared from B.2.4.6 by pipette and add to the test sample and control sample respectively, to ensure the uniform distribution of bacterial solution, and the bacterial solution should not touch the wall of the bottle. The stopper/lid should be plugged tightly to prevent evaporation. Incubate the bottles containing the inoculated samples at (37 ± 1) °C for 18 h to 24 h.

B.2.5.3 Recovery of surviving bacterial

At the end of incubation time, add 100 mL phosphate buffer to the bottle containing the sample, and shake the bottle at 200 RPM for 1 min. Using physiological saline, perform serial dilution to 10^{-2}. Plate out each dilution (including buffer) using NA. Pour approximately 15 mL of molten NA into each Petri dish and swirl gently to disperse the bacteria. All plating shall be performed in duplicate. Replace the lids, invert the Petri dishes and incubate at (37 ± 1) °C for 40 h to 48 h. After incubation, count the number of colonies in the Petri dishes containing 30 to 300 colonies. For each dilution series, record the number of colonies recovered to two significant figures, as well as the dilution factor for the plates used for counting.

B.2.5.4 Expression of results

For each sample, the number of viable bacteria recovered is determined using Formula (3):

$$N = (C \times D \times V) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Wherein:

N is the number of viable bacteria recovered per sample; measured in CFU
C is the average plate count for the duplicate plates;
D is the dilution factor for the plates counted; and
V is the volume, in ml, of Phosphate buffer added to the sample.

The antibacterial rate is calculated using Formula (4):

$$R = \frac{N_b - N_a}{N_b} \times 100\ \% \quad \ldots\ldots\ldots\ldots\ldots\ldots(4)$$

Wherein:

R, antibacterial rate, expressed as a percentage (%);
N_a, the average number of bacteria recovered from the test sample, measured in CFU; and
N_b, the average number of bacteria recovered from the control sample, measured in CFU.

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Annex C
(normative)

Test method for bacterial elimination performance

C.1 Eliminating bacterial for air

C.1.1 The test method shall be referred to IEC PAS 60386-3-1.

C.2 Eliminating bacterial for surface

C.2.1 Principle

Bacterial suspension on nutrient agar is spread and placed it in the suitable areas of the refrigerator. The bacterial elimination rate is calculated by comparing the viable bacterial count with the refrigerator purification module turned on and off.

This test required at least two units of refrigerators of the same model, with one unit having its purification device(s) disabled. The test shall be run concurrently.

C.2.2 Bacterial strains, reagents and culture media

C.2.2.1 Bacteria strains

a) ***Staphylococcus aureus***, ATCC 6538 P, (eliminating bacterial for surface).

b) ***Escherichia coli***, ATCC 8739, (eliminating bacterial for surface).

C.2.2.2 Reagents

a) **Distilled water**, 1 000 mL.

b) **NaoH solution**, 0.1 mol/L, pH 7.0 to 7.2.

C.2.2.3 Culture media

c) **a) Nutrient broth medium (NB)**, biochemical reagent.

d) **b) Nutrient agar medium (NA)**, biochemical reagent.

C.2.3 Apparatus

a) **Biochemical incubator**, with a temperature control accuracy of ±1 °C.

b) **Refrigerator**, temperature of 5 °C to 10 °C .

c) **Electrically heated drying oven**, ambient temperature up to 200 °C.

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d) **Autoclave**, capable of maintaining a temperature of (121 ± 2) °C and a pressure of (103 ± 5) kPa.

e) **Petri dish**, sterile, 90 mm to diameter.

f) **Pipettes**, with an accuracy of 0.01 mL, 1 000 µl sterile tips.

g) **Inoculation loop**.

C.2.4 Test environment

C.2.4.1 Environment for strain preparation

The experiment shall follow aseptic operation techniques.

C.2.4.2 Operating environment for instruments

The operating environment temperature for instruments is (25 ± 2 °C).

C.2.5 Test preparation

C.2.5.1 Preparation of Nutrient Broth Medium (NB)

a) **Beef extract**, 3.0 g.
b) **Peptone**, 10.0 g.
c) **Sodium chloride**, 5.0 g.

Preparation method: Dissolve the above components in 1 000 mL distilled water, heat to dissolve, adjust the pH after sterilisation to 7.0 to 7.2 with 0.1 mol/L NaOH solution, divide, and sterilise at 121 °C in an autoclave for 15 min.

If a commercial medium is used, prepare and sterilise according to the product's specified method and conditions.

C.2.5.2 Preparation of Nutrient Agar Medium (NA)

a) **Beef extract**, 3.0 g.
b) **Peptone**, 10.0 g.
c) **Sodium chloride**, 5.0 g.
d) **Agar**, 15.0 g.

Dissolve the above components in 1 000 mL distilled water, heat to dissolve, adjust the pH after sterilisation to 7.0 to 7.2 with 0.1 mol/L NaOH solution. Add agar, dissolve, and sterilise at 121 °C in an autoclave for 15 min.

If a commercial medium is used, prepare and sterilise according to the product's specified method and conditions.

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C.2.5.3 Preparation of inoculation nutrient solution

Use a physiological saline solution of nutrient broth medium (NB) for preparation. The NB concentration for *Escherichia coli* culture is 0.2 %, and for *Staphylococcus aureus* culture, it is 0.2 % to 1.0 %. To facilitate bacterial dispersion, a small amount of the surfactant tween-80 can be added. Adjust the pH after sterilisation to 7.0 to 7.2 with 0.1 mol/L NaOH solution. Divide, and sterilise at 121 °C in an autoclave for 15 min.

C.2.5.4 Preparation of diluent

a) **Disodium hydrogen phosphate ($NaHPO_4$, anhydrous)**, 2.83 g.
b) **Potassium dihydrogen phosphate (KH_2PO_4)**, 5.0 g.
c) **Non-ionic surfactant tween-80**, 1.0 g.

Dissolve the above components in 1 000 mL distilled water and sterilise at 121 °C in an autoclave for 15 min.

If a commercial medium is used, prepare and sterilise according to the product's specified method and conditions.

C.2.5.5 Preservation of bacterial strains

Inoculate standard bacterial strains on a NA slant and incubate at (37 ± 1) °C for 24 h. Keep at 5 °C to 10 °C (not exceeding one month) as slant-preserved strain.

C.2.5.6 Activation of bacterial strains

Transfer slant-preserved strain to a NA plate and incubate at (37±1) °C for (24±1) h. For testing, use freshly cultured bacteria transferred up to 5 generations and within 24 h.

C.2.5.7 Preparation of bacterium suspension

Use an inoculating loop to collect 1 to 2 loops of fresh bacteria from C.2.5.6 fresh cultures. Add to the inoculation nutrient solution and sequentially dilute by a factor of 10. Select a dilution with a bacteria solution concentration of 1 x 10^3 CFU/mL to 3 x 10^3 CFU/mL as the test bacteria solution for test procedure of eliminating bacterial for surface.

C.2.6 Test procedure

The test and control group refrigerators are operated under empty load for 24 h at ambient temperature of (25 ± 2) °C. The refrigeration compartment is set at 4 °C. Importantly, during the entire empty load operation, the sterilisation program remains inactive.

C.2.6.2 Test procedure of bacterial eliminating for surface

C.2.6.2.1 The refrigeration compartment is maintained at (6 ± 2) °C for 24 h. Importantly, during the entire empty load operation, the sterilisation program remains inactive.

C.2.6.2.2 0.1 mL bacterium suspension is evenly spread on a solid agar petri dish with the initial bacterial count between 100 CFU/dish to 300 CFU/dish.

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C.2.6.2.3 Place the inoculated petri dishes in the upper, middle, and lower levels of the refrigerator or, at the central position of the claimed sterilisation purification area as indicated by the manufacturer. Open the culture dish lids. Then, activate the purification device for the test group, while leaving it inactive for the control group. Follow any specified time guidelines from the manufacturer for the sterilisation duration. If none are provided, run the operation for 24 h.

C.2.6.2.4 After the required operational time or 24 h, pour approximately 5 mL of molten nutrient agar, maintained at 45 °C, onto the exposed inoculated petri dish. After solidification, invert the petri dish and incubate at (36±1) °C. After incubating for (48±2) h, record the viable bacteria on the petri dish.

C.2.7 Expression of results

C.2.7.1 Test validity

After the test, the control group's recovered viable bacteria count shall not be less than 1.0×10^{2} CFU/dish.

C.2.7.3 Calculation of bacterial elimination rate for surface

The bacterial elimination rate is calculated using Formula (5):

$$R_1=\frac{B_1-B_2}{B_1}\times100\ \% \qquad \text{(5)}$$

Wherein:

R_1 , the bacterial elimination rate of the purification module's surface, measured in (%);

B_1, the average recovered bacterial count for refrigerator samples with the sterilisation device deactivated (control refrigerator), measured in (CFU/dish); and

B_2, the average recovered bacteria for refrigerator samples count with sterilisation device activated, measured in (CFU/dish).

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Annex D
(normative)

Test method for mould prevention performance

D.1 The test method shall be referred to ASTM G21.

D.2 Mould prevention is graded as follows:

Grade 0 = Specimen remained free of fungal growth.

Grade 1 = Traces of growth on the specimen (less than 10 %).

Grade 2 = Light fungal growth on the specimen (10 to 30 %).

Grade 3 = Medium fungal growth on the specimen (30 to 60 %).

Grade 4 = Heavy fungal growth on the specimen (60 % to complete coverage).

The method does not outline the pass/fail criteria. However, the test method may be terminated earlier for specimens that are experiencing a rating of “2” or higher.

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