



Microbiological Testing of Foods, Beverages and Drinking Water

Nutrient Pad Sets

Simplifying Progress

SARTORIUS

Introduction

The consumer's steadily growing requirements for the quality and the longer shelf life of foods and beverages must be met by the manufacturer. Quality assurance can't be limited to inspection of the final product alone, such as a bottled beverage or a prepared food product. Instead, continuous inspection of incoming raw materials and in-process quality control tests must be performed throughout production. Microbiological and aseptic testing play a significant role in such quality assurance.

In the soft drink industry the microbiological and hygienic quality including the biological stability of the products are important criteria for their assessment. The reason: just a few microbes are often all it takes to spoil large quantities of a beverage.

Although the explosive technological development has reduced the risk of contamination by spoiling microbes, the issue of shelf life has taken on new dimensions as a result of the enormous production output possibilities of today. Quality control of bottling and filling, in terms of chemical and, above all, biological stability, must be adapted to this development by state-of-the-art test methods.

The requirements for a practical microbiological test method are that it permits quantitative and reproducible detection of trace contamination and that it can be performed efficiently and economically under routine conditions. These requirements are fulfilled optimally by the membrane filter method.

The principle of this method is based on the concentration of microorganisms from relatively large samples on the surface of the membrane filter, and on culturing these microbes on a nutrient pad or an agar culture medium.



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The Membrane Filter Method

Description

The Membrane Filter Method

A membrane filter of the appropriate pore size is placed in a filter holder, and the sample is filtered. In this process microorganisms in the test sample are retained on the filter surface by the screening action of the membrane filter.

Growth inhibitors can be removed by flushing the membrane with sterile NaCl solution after filtration. Afterwards, the membrane filter is placed on a culture medium and incubated.

Nutrients and metabolites are exchanged through the pore system of the membrane filter. Colonies, which have developed on the membrane filter surface during incubation, are counted and related to the sample volume.

The Advantages:

■ Proven accuracy

Compared with the direct method, considerably larger sample volumes can be tested. This concentration effect increases the accuracy of microbial detection.

■ Quantitative results

The visible colonies can be related directly to the sample volume.

■ Documentation

The membrane filter with colony growth can be filed as a permanent record of the test.

No Inhibitors

Inhibitors, such as essential oils or disinfectants, can be flushed from the membrane filter after filtration.

GMP Quality

Sartorius Membrane Filters are manufactured under GMP conditions, ensuring consistently quality and high reproducibility from batch to batch and within each batch.

The Culture Media

Microorganisms can be detected by different methods.

Methods involving culturing techniques and the microscope are used to detect microbes, whereas biochemical and serological techniques are commonly applied to differentiate among such organisms.

For detecting microorganisms in cultures, liquid and solid culture media are employed. Microorganisms are concentrated by growth in or on these culture media.

Quantitative detection is only possible with solid culture media because the individually developing colonies can be evaluated and counted on the surface.

The following culture media can be used for microbiological testing:

■ Nutrient Pad Sets

Nutrient Pad Sets definitely optimize the membrane filter method. They standardize microbiological test procedures, making them much more efficient.

They simplify laboratory work. They help to save time and money.

■ Absorbent pads to be wetted with culture media.

■ Culture media with agar or gelatin as the solidifying agent.

The nutrient Pad Sets are described on the following pages and certainly offer the most convenient way to use the membrane filter method.

Direct Method

The test sample is pipetted into a petri dish...

...then mixed with the culture medium and incubated

Membrane Filter Method

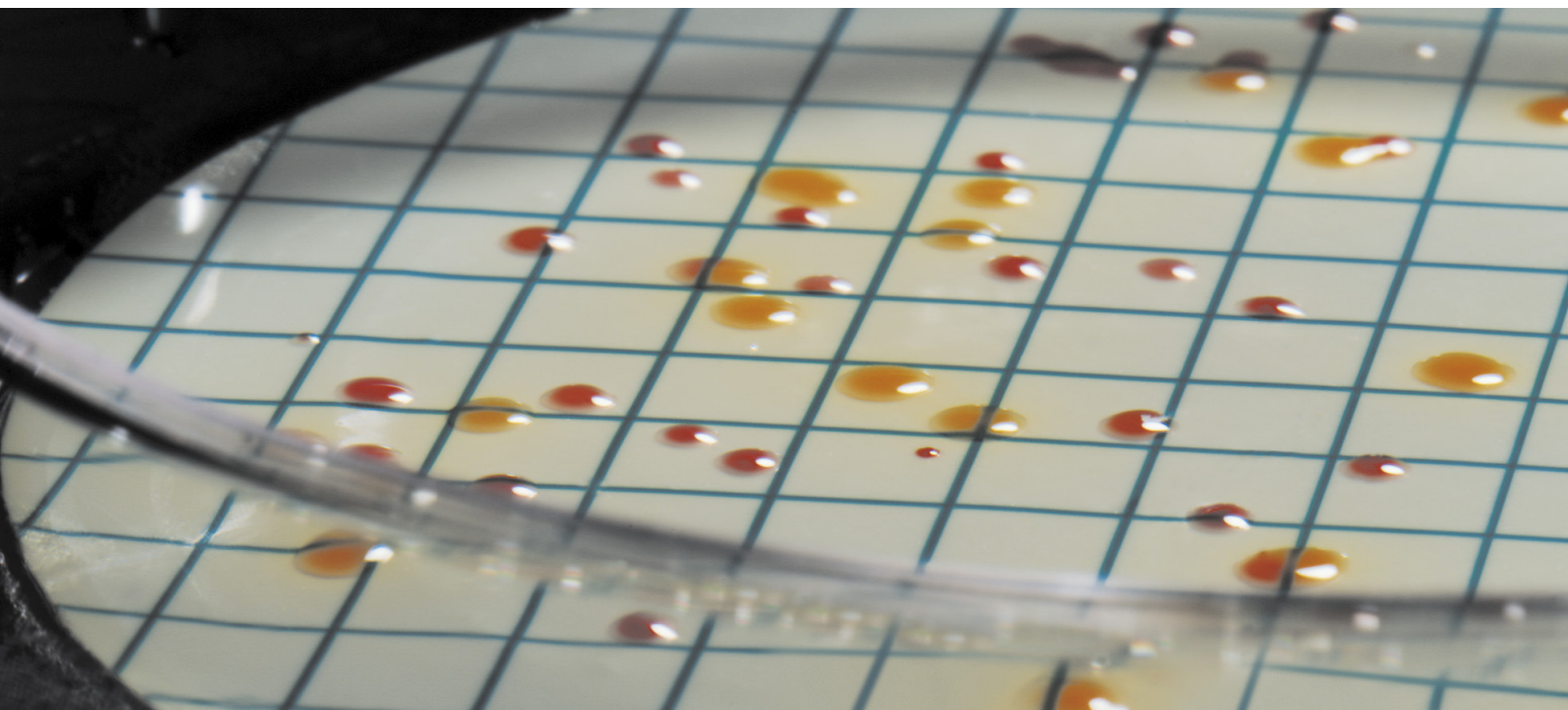
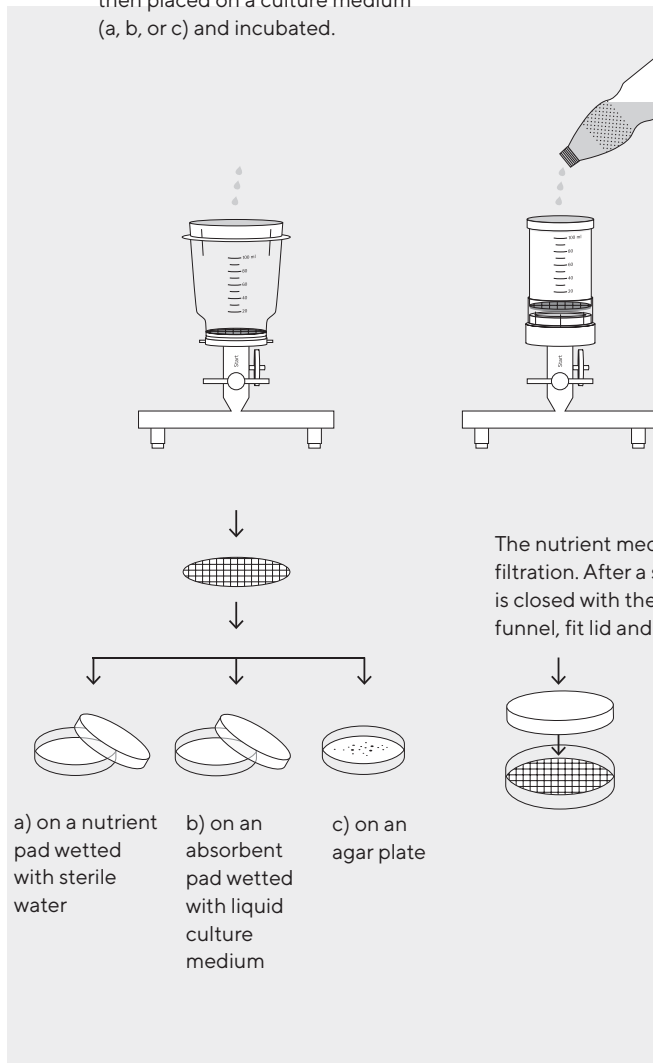
The test sample is filtered through a membrane filter

Standard MF method

The membrane filter is rinsed and then placed on a culture medium (a, b, or c) and incubated.

Monitor MF method

The nutrient media is given from the top after filtration. After a short vacuum (<1 sec.), the monitor is closed with the plug at the bottom. Remove the funnel, fit lid and base to a petri dish.



Nutrient Pad Sets

Sartorius Nutrient Pad Sets have been used successfully in the membrane filter method for over 30 years. Practical and easy to handle, they reduce labor and simplify many microbiological testing procedures.

Nutrient pads are sterile, dehydrated culture media. Once they are moistened with 3.0–3.5 mL of sterile and demineralized (or distilled) water they are ready to use immediately.

The level of moisture is optimal when an excess ring of water surrounding the pad is visible.

All Nutrient Pad Set types are supplied with the appropriate membrane filters, which are also presterilized and individually packaged or dispenser-ready packaged on a band for the use with the Microsart® E-motion dispenser.

The membrane filters tailored to meet the special requirements of microbial detection are available with 47 mm or 50 mm diameters.

Nutrient pad sets (NPS) are continuously enhanced as part of our development program to adapt our products to changing application requirements. Besides the new NPS types, we have also updated our packaging design. The standard NPS box contains 100 sterile nutrient pads, each of which is individually inserted in a petri dish and sterilized. Ten each of these petri dishes are sealed in an aluminum bag. This special packaging in bags protects the sensitive formula constituents of the nutrient pads during transport and storage from fluctuations in humidity and temperature. As a result, it guarantees the high quality of our NPS throughout their entire shelf life of up to 24 months.



User Benefits

Economical	
Eliminates time-consuming and labor-intensive preparation of culture media (sterilization and cleaning, among others).	After wetting with 3.5 mL distilled water NPS are ready to use: NPS and go
Simple to Use	
Nutrient Pad Sets can also be used in laboratories which do not have extensive microbiological equipment. Sterile water for moistening the pads can be added easily with a Sartorius Dosing Syringe and an attached Syringe Filter (0.2 µm) or with a Prospenser.	Everyone can use NPS
Consistently Quality	
During manufacture, each type of Nutrient Pad Set is compared with the corresponding agar medium with respect to their growthpromoting properties. This QA procedure ensures consistent quality and reproducible results.	NPS are validated. In comparison to agar which is done within different deviations of amount and height NPS always give constant results
Trouble-free Storage	
Nutrient Pad Sets have a shelf life of up to 24 months at room temperature.	No waste or overproduction of prepared agar media
Highly Versatile	
Nutrient Pad Sets can be modified by additives in the solution used to wet them; for example, Wort or Orange Serum Nutrient Pads when wetted with 5 – 8% ethanol promote the growth of acetic-acid bacteria	Advanced system

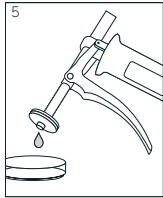
Colony Counting by the Membrane Filtration Method

Easy and Reliable With Microsart® Funnel

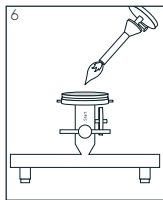
- **Microsart® Manifold**
- **Microsart® Funnel**
- **Microsart® E-motion Dispenser**
- **Gridded Membrane Filters**
- **Nutrient Pads**

1. Before starting with the tests remove everything that is not essentially needed for this work.
2. Carefully clean and disinfect your working area.
3. For simple microbiological tests a laminar flow box is not needed.
When used unprofessionally, a laminar flow box increases the risk of secondary contamination instead of protecting from it. A good protection against airborne contamination, however, is to work close to the flame of a Bunsen burner. Instruments like forceps should be placed into a glass with alcohol.

4. Label the needed amount of Nutrient Pads.



5. Wet the Nutrient Pad with 3.5 mL of sterile, deionized or distilled water. Use a dosing syringe with a Minisart® or a sterile pipette. Open the lid of the Petri dish only slightly to avoid airborne contamination.

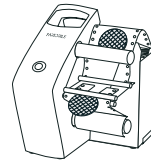


6. Open the vacuum valve.
Carefully flame the filter support for ~10 sec.

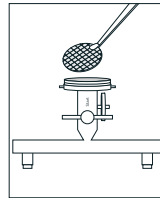
Close the vacuum valve again.



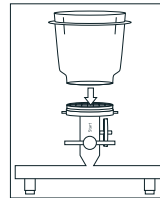
7. The forceps should always be stored in a small glass with alcohol. Take it out of it and flame it.
Let it cool off for a few seconds before use.



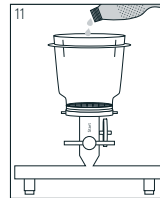
8. Let the Microsart® E-motion Dispenser release the membrane filter automatically by approaching tweezers or by press button. Alternatively you peel back the transparent plastic layer of the membrane filter packaging manually. Use tweezers to remove the content out of the packaging.



9. The membrane filter is placed by the tweezers onto the filter support of the filter holder. The protective paper or grid should face upwards. If there is a protective disc make sure to discard it before assembling the funnel or the top part of the filter holder.

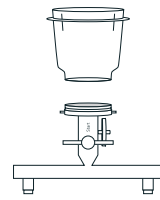


10. Place the Microsart® Funnel on the filter support.



11. Open the valve and filter the sample.
Rinse with a few mls of sterile water to remove all product residues or inhibitors that might be contained in the sample.

Close the valve again.



12. Remove the funnel and take the filter with the sterile forceps.

13. Place the filter on the Nutrient Pad, avoid to entrap air bubbles under the filter. Open the lid of the Petri dish only slightly to avoid airborne contamination.

14. Place the Petri dish into the incubator, lid above.
Incubate strictly according to the recommendations. Evaluate immediately after the end of the incubation time.

Nutrient Pad Set Types and Typical Growth Evaluation Results

1. Total Colony Count

Caso NPS

Type 14063

Soybean-Casein Digest medium for isolating microorganisms and for determining the total CfU count. Dehydrated culture medium for cultivating microorganisms in pharmaceuticals, cosmetics, raw materials, water (general quality), waste water, foods and other products.

References

APHA (dairy), APHA (food), APHA (water), AOAC, DAB, EG 98/83, EP, FDA, IDF, ISO 7704, ISO 8199, ISO 9308-1 [1990], ISO 9308-1 [2001], USDA, USP

Incubation Conditions

Bacteria: ≤ 3 days at 30–35 °C
Yeasts and molds: ≤ 5 days at 30–35 °C

Evaluation and Typical Results

Predominantly bacteria of different sizes, shapes and colors. Remarks: Depending on the microbes to be detected, this medium can be converted into a selective one. When 10% serum is added to the wetting liquid a number of fastidious pathogenic bacteria like the genera *Pneumococcus*, *Neisseria*, *Streptococcus*, *Corynebacterium*, *Erysipelothrix* and *Brucella* are able to grow on the medium.

R2A NPS

Type 14084

Low nutrient medium for the enumeration of heterophilic organisms in treated potable water and highly purified water. Growth medium for microorganisms which have adapted to the particular living conditions of water low in nutrients. Dehydrated culture medium for cultivating microorganisms in water for pharmaceutical purpose, water (general quality), waste water and other products.

Reference

APHA (water), EP, ISO 7704

Incubation Conditions

≥ 5 days at 30–35 °C

Evaluation and Typical Results

Predominantly bacteria grow on this medium. Their colonies are of different size and color, most of them are white or colorless. Remarks: Stressed and chlorine-tolerant bacteria are stimulated by this medium in combination with lower incubation temperatures and longer incubation time.

Standard TTC (I mod.) NPS

Type 14055

Meat extract-peptone medium for determining the total CfU count based on the "APHA (water)" and modified by the addition of TTC. Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), waste water, beverages, beer, foods and other products.

References

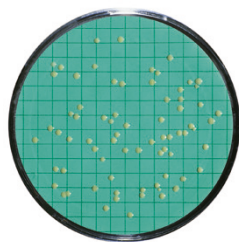
APHA (water), ISO 7704, VLB

Incubation Conditions

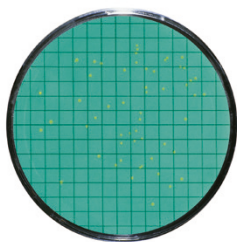
≤ 5 days at 30–35 °C

Evaluation and Typical Results

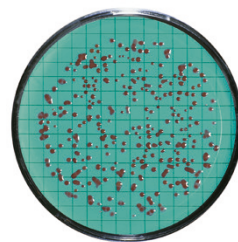
Predominantly bacteria grow on this medium. The majority of their colonies are stained red by TTC reduction.



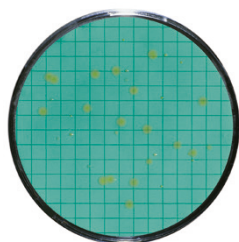
Staphylococcus aureus



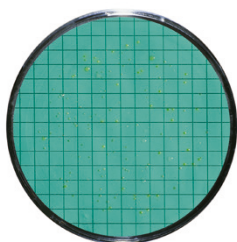
Escherichia coli



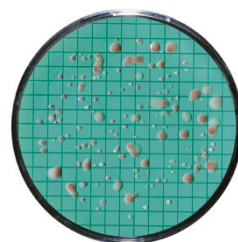
Bacillus subtilis



Mixed culture from process water



Mixed culture from water



Mixed culture from well water

Standard NPS

Type 14064

Meat extract-peptone medium for determining the total CfU count; based on the "APHA (water)". Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), waste water, beverages, beer, foods and other products.

References

APHA (water), ISO 7704, VLB

Incubation Conditions

≤5 days at 30 – 35 °C

Evaluation and Typical Results

Predominantly bacteria grow on this medium. The morphology and color of their colonies vary.

TGE NPS (Plate Count)

Type 14076

Tryptone Glucose Extract medium for isolating microorganisms and for determining the total CfU count. Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), waste water, beverages, soft drinks, concentrates, foods and other products.

References

APHA (dairy), APHA (food), APHA (water), API, ISO 7704

Incubation Conditions

≤5 days at 30 – 35 °C

Evaluation and Typical Results

On this medium predominantly colonies of bacteria grow that can have different size and colors.

Yeast Extract NPS

Type 14090

For the detection of the total count of aerobic heterotrophic bacteria. Dehydrated culture medium for cultivating microorganisms in water (general quality) and other products.

References

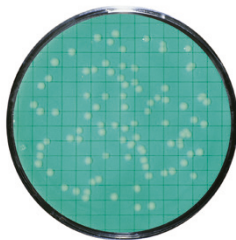
EG 98/83, HMSO, ISO 6222, ISO 7704, ISO 8199

Incubation Conditions

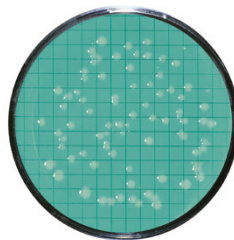
44 ±4 hours at 36 ±2 °C;
68 ±4 hours at 22 ±2 °C

Evaluation and Typical Results

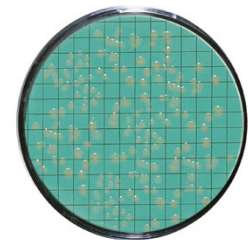
Predominantly bacteria grow on this medium. The majority of all colonies are colorless.



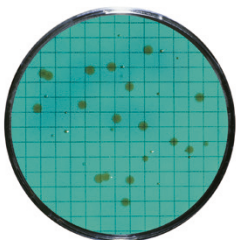
Escherichia coli



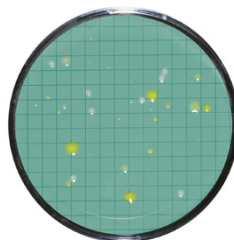
Escherichia coli



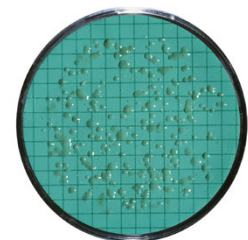
Escherichia coli



Mixed culture from drinking water



Mixed culture from water



Mixed culture from river water

2. E. Coli and Coliforms, Enterobacteria

Chromogenic Coliform NPS

Type 14049

Dehydrated chromogenic selective media for the detection of *Escherichia coli* and coliform bacteria from drinking water and water with low accompanying flora (according to DIN EN ISO 9308-1:2014).

References

DIN EN ISO 9308-1 (2014), ISO 7704

Incubation conditions

18 – 24 hours at 36 °C ±2 °C

Evaluation and Typical Results

E. coli develops dark blue colonies (with a violet halo) and violet colonies (positive β -galactosidase- and β -glucuronidase reaction). Coliform bacteria develop pink to purple colonies (positive β -galactosidase reaction) and dark blue colonies (with violet halo) and violet colonies (positive β -galactosidase- and β -glucuronidase reaction: *E. coli*). Other gram negative bacteria show cream colored to colorless colonies. Accompanying flora appears as colorless colonies, except for some organisms, which possess β -D-glucuronidase activity. These colonies appear light blue to turquoise in color.

CHROMOCULT®* NPS

Type 14087

For the detection of total coliforms and *Escherichia coli*. Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), waste water, beverages, foods and other products.

References

ISO 7704, Journal Food Protection, ZenHyg (journal of hygiene)

Incubation Conditions

20 – 28 hours at 36 ±2 °C

Evaluation and Typical Results

E. coli develops dark-blue to violet colonies, other coliforms red to pink colonies. Other gram-negative colonies are colorless, a few with β -Glucuronidase activity are light blue to turquoise. Remarks: To confirm *E. coli* give one drop of Kovacs indole reagent on each dark blue colony. Cherry red color after a few seconds is a positive reaction.

ECD NPS

Type 14082

Selective culture medium for detecting and identifying *Escherichia coli*. Bile salt inhibits the accompanying flora of microbes not living in the intestine. Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), waste water, beverages, foods and other products.

References

APHA (water), DIN 10110, EG 98/83, ISO 7704, ISO 8199, ISO 9308-1 [2001], LMBG, USDA

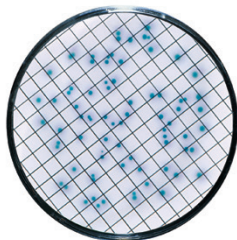
Incubation Conditions

16 – 18 hours at 44 ±2 °C

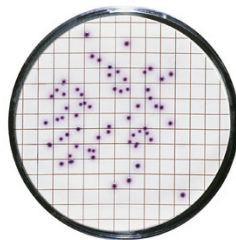
Evaluation and Typical Results

Colonies that show light blue fluorescence under UV light indicate *E. coli*; confirmation with a drop of KOVÁCS indole reagent is required, a positive reaction is shown by a cherry color after a few seconds. Remarks: This medium can be used for the rapid detection of *Escherichia coli* based on the ISO 9308-1.

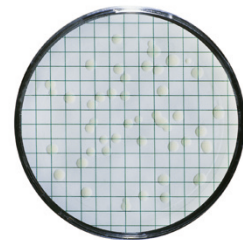
*Trade mark owner and manufacturer is Merck KGaA.



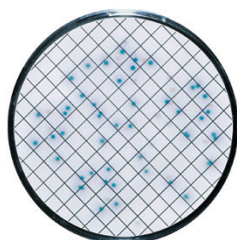
Escherichia coli



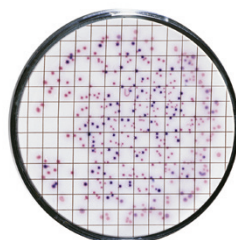
Escherichia coli



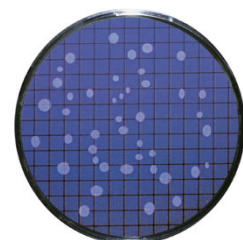
Escherichia coli



E. coli and *Enterobacter aerogenes*



Mixed culture from water



E. coli colonies fluorescence in UV light

Endo NPS

Type 14053

Selective medium for detecting and enumerating *E. coli* and coliform bacteria. Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), natural water, waste water, beverages, soft drinks, concentrates, fruit juice, sugar, sugar products, foods and other products.

References

APHA (dairy), APHA (food), APHA (water), DGHM, ISO 7704, ISO 9308-1 [1990], MNO, USDA

Incubation Conditions

18–24 hours at 36 ±2 °C

Evaluation and Typical Results

E. coli form red colonies with a metallic sheen and a red dot at the underside of the membrane. Other coliforms grow as dark to light red colonies without metallic sheen. Colorless colonies or colonies with other color are not counted.

MacConkey NPS

Type 14097

For the isolation and differentiation of coliform bacteria and other enterobacteriaceae. Dehydrated culture medium for cultivating microorganisms in pharmaceuticals, cosmetics, raw materials, water (general quality), natural water, waste water, beverages, soft drinks, concentrates, fruit juice, foods and other products.

References

APHA (dairy), APHA (food), APHA (water), AOAC, DAB, DIN 38411, DGHM, EP, ISO 7704, LMBG, MNO, USDA, USP

Incubation Conditions

18–72 hours at 30–35 °C

Evaluation and Typical Results

Escherichia coli forms large red or reddish colonies, coliform microbes form large pink, sometimes slimy colonies, lactose-negative enterobacteria form colorless colonies. Gram-positive microbes are inhibited.

m FC NPS

Type 14068

For the detection of *E. coli* and faecal coliform bacteria according to Geldreich et al. Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), waste water, beverages, foods and other products.

References

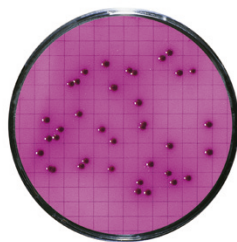
APHA (food), APHA (water), AOAC, EPA, FDA, ISO 7704, ISO 9308-1 [1990], USDA

Incubation Conditions

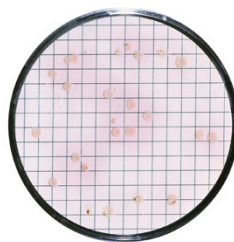
18–24 hours at 36 ±2 °C

Evaluation and Typical Results

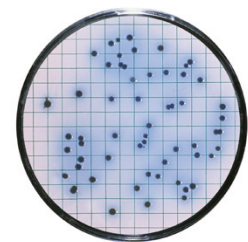
E. coli and coliform bacteria form blue colonies with a blue surrounding. This color is dark blue at faecal coliforms with strong lactose fermentation and lighter blue for non-faecal coliforms with weaker lactose fermentation. Lactose-negative bacteria grow with different colors and are not evaluated. Remarks: Higher incubation temperatures largely suppress the nonfaecal coliforms.



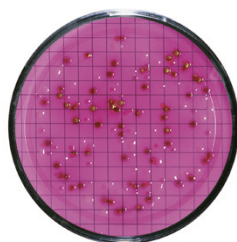
Escherichia coli



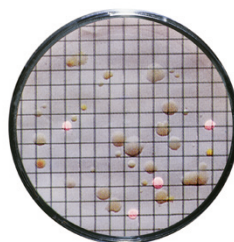
Escherichia coli



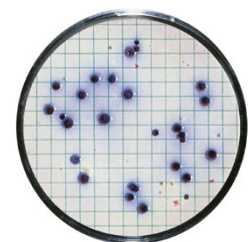
Escherichia coli



E. coli and coliforms from river water



E. coli and coliforms from river water



E. coli and coliforms from waste water

Teepol NPS

Type 14067

Lauryl Sulphate medium for the detection of *E. coli* and faecal coliform bacteria according to Burman, N.P. (1967). Dehydrated culture medium for cultivating microorganisms in water (general quality), waste water, beverages, foods and other products.

References

AFNOR, APHA (water), BS, FDA, ISO 7704, USDA

Incubation Conditions

18 – 24 hours at 36 ± 2 °C

Evaluation and Typical Results

E. coli and coliform bacteria form 1–2 mm diameter yellow colonies surrounded by a yellow zone. Non-lactose fermenting bacteria develop red or colorless colonies without yellow zone.

Tergitol TTC NPS

Type 14056

Selective and differential medium for the detection and enumeration of coliform bacteria and *E. coli* according to Pollard; modified acc. to Chapman. Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), waste water, beverages, foods and other products.

References

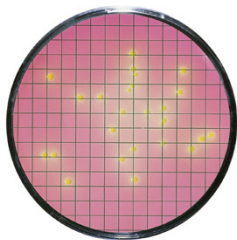
APHA (food), EG 98/83, ISO 7704, ISO 8199, ISO 9308-1 [1990], ISO 9308-1 [2001]

Incubation Conditions

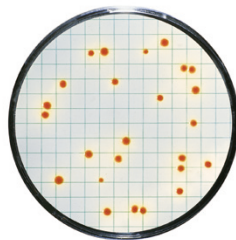
18 – 24 hours at 36 ± 2 °C

Evaluation and Typical Results

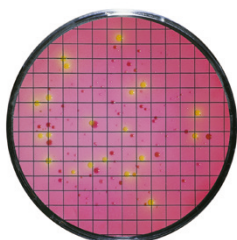
Lactose-positive microorganisms form yellow-orange colonies with a yellow surrounding and have a yellow dot under the membrane filter. According to ISO 9308-1 all colonies that show yellow color under the membrane filter are counted as positive. Remarks: Tergitol 7 inhibits Gram positive colonies and minimizes the swarming of *Proteus*. Further differentiations of *E. coli* and coliforms with Oxidase- and Indol-Tests are required.



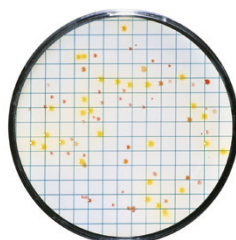
Escherichia coli



Escherichia coli



E. coli and coliforms from waste water



E. coli and coliforms from waste water

3. Other Faecal Bacteria

Azide NPS

Type 14051

For the detection and enumeration of intestinal enterococci according to Slanetz and Bartley. Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), natural water, waste water, beverages, foods and other products.

References

APHA (food), APHA (water), EG 98/83, HMSO, ISO 7704, ISO 7899-2, ISO 8199, LMBG, MNO

Incubation Conditions

40–48 hours at 36 ±2 °C

Evaluation and Typical Results

Enterococci form red, pink or reddish brown colonies with a diameter of 0.5–2 mm.

Remarks: Enterococci are considered to be indicator organisms of faecal contamination. They are less sensitive to chemical effects than are *E. coli* organisms and are therefore longer detectable, for instance in waste water and in chlorinated water.

Bismuth Sulfite NPS

Type 14057

Selective culture medium according to Wilson and Blair for isolating *Salmonella typhi* and other salmonellae. Dehydrated culture medium for cultivating microorganisms in pharmaceuticals, cosmetics, raw materials, water (general quality), waste water, foods and other products.

References

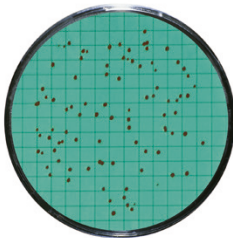
AFNOR, APHA (dairy), APHA (food), AOAC, DGHM, FDA, HMSO, ISO 6579 [1981], ISO 7704, USDA

Incubation Conditions

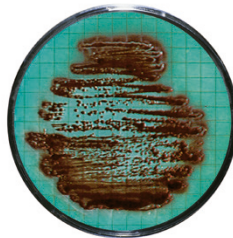
40–48 hours at 36 ±2 °C

Evaluation and Typical Results

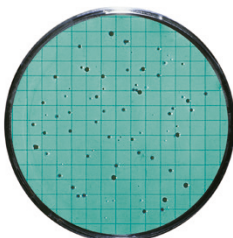
Most salmonellae form light colored colonies with brown to black centers surrounded by a black zone with a metallic sheen ("fish eye"). Some *Salmonella* species develop uniformly dark brown to black colonies which may lack the typical zone. Remarks: If a very slight contamination with salmonellae is suspected, prepare a selective enrichment culture and subsequently streak the sample with an inoculation loop on a membrane filter that has been placed on the pre-wetted NPS.



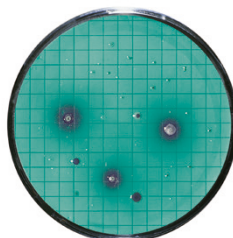
Enterococcus faecalis



Salmonella typhosa, streak



Enterococci from waste water



Salmonellae from waste water

4. Non-faecal, Pathogenic Bacteria

Cetrimide NPS

Type 14075

For the detection and enumeration of *Pseudomonas aeruginosa* according to Lowbury. Dehydrated culture medium for cultivating microorganisms in cosmetics, raw materials, water (general quality), waste water, foods and other products.

References

APHA (water), AOAC, ASM, DIN 38411, EG 98/83, FDA, ISO 7704, ISO 8199, EN 12780, EN ISO 16266

Incubation Conditions

40 – 48 hours at 36 ±2 °C

Evaluation and Typical Results

Pseudomonas aeruginosa forms blue, blue-green or yellow-green colonies with 1–2 mm diameter and blue zones. The colonies produce pyocyanin and fluorescein and show fluorescence in UV-light. Other *Pseudomonads* develop colonies with different colors.

Remarks: Further tests are necessary for definitive identification of *Ps. aeruginosa*.

Chapman NPS

Type 14074

Mannitol salt medium according to Chapman, modified for detecting and isolating pathogenic *Staphylococci*. Dehydrated culture medium for cultivating microorganisms in pharmaceuticals, cosmetics, raw materials, water (general quality), waste water, foods and other products.

References

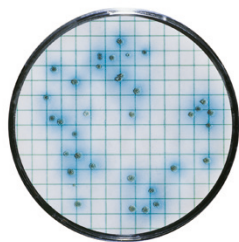
APHA (food), AOAC, DGHM, FDA, HMSO, ISO 7704, USP

Incubation Conditions

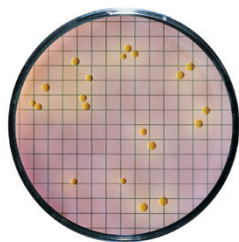
18 – 72 hours at 30 – 35 °C

Evaluation and Typical Results

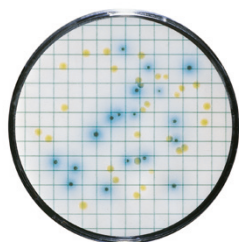
Staphylococcus aureus forms yellow colonies with a yellow surrounding (mannitol-positive). Other *Staphylococci* grow without zones of color change. Most other bacteria are inhibited.



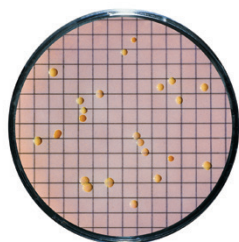
Pseudomonas aeruginosa



Staphylococcus aureus



Mixed culture with *Pseudomonas aeruginosa*



Mixed culture of staphylococci

5. Yeasts and Molds

Lysine NPS

Type 14061

Selective medium for isolating and enumerating “wild yeasts” in breweries acc. to Morris and Eddy. Dehydrated culture medium for cultivating microorganisms in beer and other products.

References

Journal Institute of Brewing, VLB

Incubation Conditions

3–5 days at 30–35 °C

Evaluation and Typical Results

Only “wild yeasts” (not belonging to the genus *Saccharomyces*) which utilize lysine as sole source of nitrogen grow on this medium, they form white or cream colored colonies; brewery culture yeasts grow not at all or very poorly.

Malt Extract NPS

Type 14086

For the isolation and enumeration of yeasts and molds. Dehydrated culture medium for cultivating microorganisms in beverages, wine, soft drinks, concentrates, fruit juice, foods and other products.

References

APHA (food), AOAC, IFU

Incubation Conditions

3–5 days at 20–25 °C or at 30–35 °C depending on the target of the investigation

Evaluation and Typical Results

Yeasts normally develop smooth white, rarely colored colonies. Molds generally form velvety or fluffy, cotton-like colonies that are white during the early growth phase and later, after conidiospore formation, of various colors. Remarks: The low pH of this medium suppresses the growth of most bacteria. This medium is available with two different types of membrane filters.

Sabouraud NPS

Type 14069

For the cultivation and enumeration of yeasts and molds. Dehydrated culture medium for cultivating microorganisms in pharmaceuticals, cosmetics, raw materials, water (general quality), waste water and other products.

References

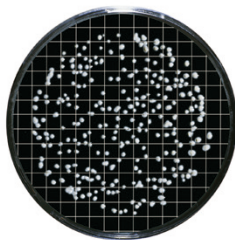
APHA (food), AOAC, EP, USP

Incubation Conditions

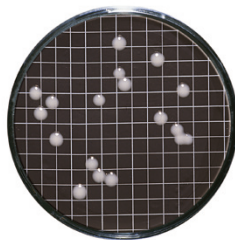
≤5 days at 20–25 °C

Evaluation and Typical Results

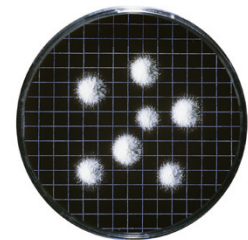
Yeasts usually develop smooth white or colored colonies. Molds form velvety or fluffy, cotton-like colonies that are white in the early growth phase and may take various colors after conidiospore production. Remarks: According to the EP | USP antibiotics could be added immediately before use.



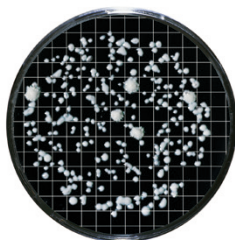
Torulopsis spec.



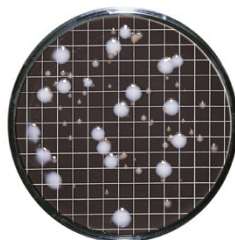
Saccharomyces cerevisiae



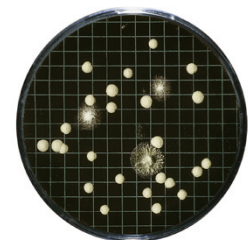
Alternaria humicola



“Wild yeasts” from lager beer



Mixed culture from *Saccharomyces* | *Rhodotorula*



Yeasts and molds from cough syrup

Schaufus Pottinger (m Green yeast and mold) NPS

Type 14070; 14072; 14080; 14083;
14091

M Green Yeast and Mold medium for the detection of yeasts and molds according to Schaufus and Pottinger. Dehydrated culture medium for cultivating microorganisms in wine, soft drinks, concentrates, sugar, sugar products and other products.

Incubation Conditions

2–5 days at 20–25 °C or at 30–35 °C depending on the target of the investigation

Evaluation and Typical Results

Molds develop velvety or fluffy whitish or greenish colonies which can get various colors after conidiospore production. Yeasts have a smooth surface. Acid forming sugar fermenters are whitish to yellow, non-acid formers are, by contrast, greenish to blue-green. Remarks: The low pH suppresses the growth of most bacteria. This medium is available with various types of membrane filters: 3 different pore sizes and 2 different colors.

Wallerstein (WL Nutrient) NPS

Type 14089

For the detection and enumeration of the microbiological flora of brewing and fermentation processes acc. to Green and Gray (1950). Dehydrated culture medium for cultivating microorganisms in beverages, beer, wine, soft drinks, concentrates, fruit juice and other products.

References

ISO 7704

Incubation Conditions

2–5 days at 30–35 °C aerobic or anaerobic depending on the target of the investigation

Evaluation and Typical Results

Yeasts usually grow as yellowish green colonies. Molds generally form velvety or fluffy cotton-like colonies that look white in the early growth phase and may take various colors after conidiospore production. Bacteria grow slowly and their colonies are of different size and color. Remarks: The addition of 0.004 g/L cycloheximide to the wetting solution makes the medium selective for lactic acid bacteria, the growth of yeasts and molds is suppressed.

Wort NPS

Type 14058, 14092

For the detection and determination of yeasts and molds. Dehydrated culture medium for cultivating microorganisms in raw materials, beverages, beer, wine, soft drinks, concentrates, foods and other products.

References

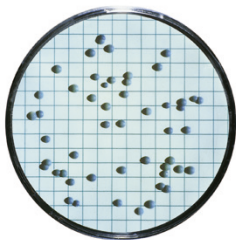
VLB

Incubation Conditions

3–5 days at 20–25 °C or at 30–35 °C depending on the target of the investigation

Evaluation and Typical Results

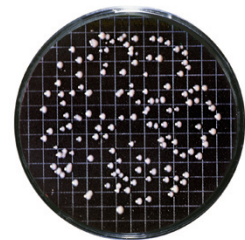
Yeasts usually develop smooth white or colored colonies. Molds generally form velvety or fluffy cotton-like colonies that look white in the early growth phase and may take various colors after conidiospore production.



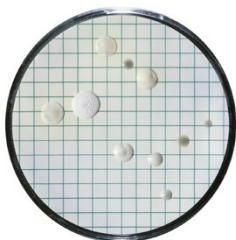
Torula lipolytica



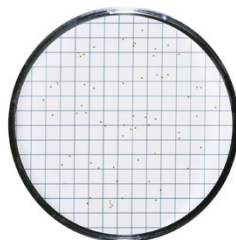
Saccharomyces cerevisiae



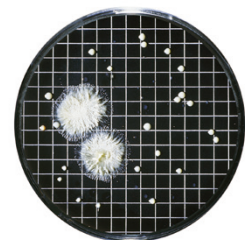
Saccharomyces cerevisiae



Mixed culture from a soft drink



Lactobacillus plantarum



Yeasts and molds from spoiled beer

6. Product-spoiling Microorganisms

Glucose Tryptone NPS

Type 14066

For the enumeration of mesophilic and thermophilic bacteria, especially “flat-sour” microorganisms in canned foods.

References

APHA (dairy), APHA (food), AOAC, ICUMSA, IFU, ISO 7704, NCA

Incubation Conditions

18–72 hours at 30–35 °C for mesophilic bacteria; 48–72 hours at 55 ±2 °C for thermophilic sporulating microorganisms

Evaluation and Typical Results

Microorganisms that ferment glucose and produce acid grow as yellowish green colonies. “Flat-sour” colonies have a diameter of 2–5 mm, a yellowish-green color and are surrounded by a yellow zone. Remarks: For the incubation at 55 ±2 °C the petri dishes must be placed into a moist chamber.

Jus de Tomate (Tomato Juice) NPS

Type 14079

For the detection of product spoiling lactic acid bacteria especially *Oenococcus oeni* acc. to Dubois, Bindan and Lafon-Lafourcade. Tight-fitting, special petri dishes for microaerophilic incubation. Dehydrated culture medium for cultivating microorganisms in wine, fruit juice and other products.

References

ISO 7704, Lanaridris& Lafon-Lafourcade

Incubation Conditions

5–7 days at 30–35 °C anaerobic (microaerophil); control for slowly growing microorganisms after 10 days is recommended

Evaluation and Typical Results

Lactobacilli form compact, whitish to slightly yellowish colonies with 1–3 mm diameter. Pediococci develop somewhat smaller colonies with approx. 1 mm diameter that later get a whitish to slightly brownish color. *Oenococcus oeni* grows as colorless to whitish colonies with a diameter smaller than 1 mm. Remarks: This medium must be incubated under anaerobic to microaerophilic conditions.

Orange Serum NPS

Type 14062; 14096

For the isolation and enumeration of acid-tolerant microorganisms. Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), waste water, wine, soft drinks, concentrates, fruit juice, foods and other products.

References

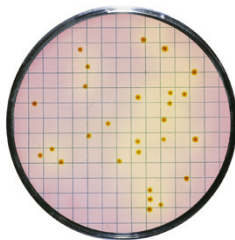
APHA (water), IFU, ISO 7704, MPP (packaging staff)

Incubation Conditions

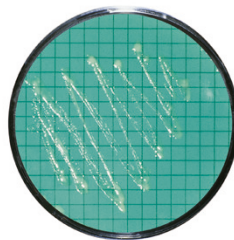
3–5 days at 30–35 °C aerobic or anaerobic depending on the target of the investigation

Evaluation and Typical Results

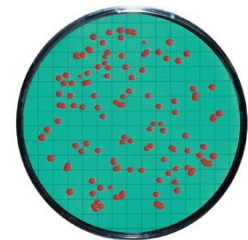
Only acid-tolerant microorganisms can grow on this medium such as lactic acid bacteria (*Lactobacillus*, *Pediococcus* etc.), acetic acid bacteria, yeasts and molds. Remarks: This medium is available with pH 5.5 and with pH 3.2.



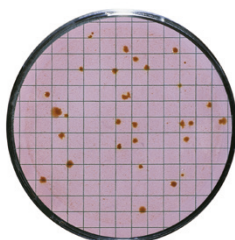
Bacillus coagulans, the “flat sour” colony



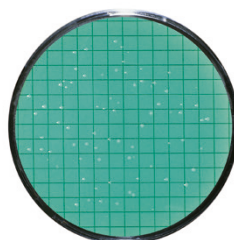
Lactic-acid bacteria, streak



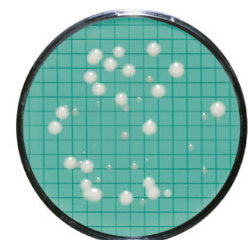
Rhodotorula spec.



Mixed culture from canned vegetables



Oenococcus oeni from wine



Mixed culture from a soft drink

VLB-S7-S NPS

Type 14059

For the detection of pediococci and lactobacilli according to Emeis; modified acc. to Rinck and Wackerbauer. Dehydrated culture medium for cultivating microorganisms in beer and other products.

References

EBC, ISO 7704, MEBAC, VLB

Incubation Conditions

3–5 days at 30–35 °C anaerobic (microaerophil)

Evaluation and Typical Results

Pediococci ("Sarcina") develop round pale green colonies with smooth peripheries and approx. 1 mm in diameter. Lactobacilli grow as slightly rounded, irregularly lobed colonies with approx. 2 mm in diameter which are initially light green and later dark green. Remarks: This medium must be incubated under anaerobic to microaerophilic conditions.

Weman NPS

Type 14065

For the detection and determination of slime-forming mesophilic bacteria according to Weman, modified acc. to Lorenz. Dehydrated culture medium for cultivating microorganisms in soft drinks, concentrates, sugar, sugar products and other products.

References

ICUMSA, ISO 7704

Incubation Conditions

3–5 days at 30–35 °C

Evaluation and Typical Results

The colonies of slime-forming mesophilic bacteria are smooth, round, usually colorless and transparent or translucent. Some have a diameter greater than 5 mm.

MRS NPS

Type 14077

For the detection of different *Lactobacillus* species and other lactic acid bacteria according to DE MAN, ROGOSA and SHARPE. Dehydrated culture medium for the isolation and cultivation of *Lactobacillus* from dairy and food products.

References

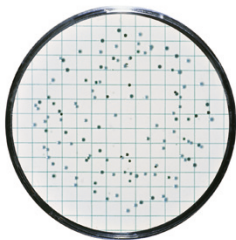
APHA (food, dairy products)

Incubation Conditions

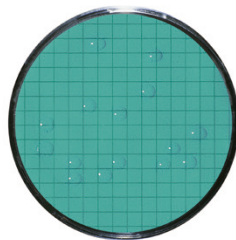
3–5 days at 30 °C anaerobic conditions

Evaluation and Typical Results

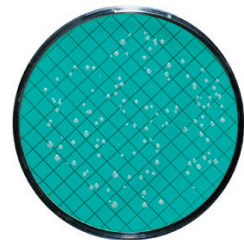
The MRS NPS are used for the detection of a variety of *Lactobacilli*. The *Lactobacilli* species grow as slightly rounded whitish colonies with approximately 1–2 mm in diameter. Other microorganisms, which have not this typical growth, can be defined by confirmation tests. *Lactobacilli* species are gram positive, Katalase negative and negative in the production of Indole and Hydrogen sulfide.



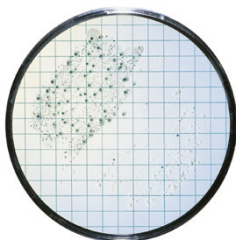
Lactobacillus brevis



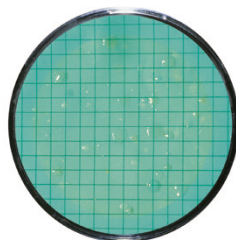
Leuconostoc mesenteroides



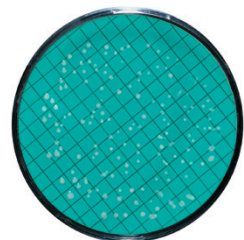
Lactobacillus brevis and *Pediococcus damnosus*



Lactobacilli and pediococci from sediment, streak



Mixed culture from sugar syrup



Lactobacillus plantarum

Yeast Mold (+ Copper) NPS

Type 14045

For the isolation of wild yeasts in beer products.

References

Institute of Brewing, Methods of Analysis

Incubation Conditions

2–3 days at 25–30°C, aerobic
until 5 days for inhibition

Evaluation and Typical Results

Aspergillus brasiliensis grow with a white mycelium and black spores. *Candida albicans* forms cream coloured colonies with sharp edge, round and glossy. *Rhodotorula mucilaginosa* grow as pale red coloured colonies with sharp edge, round and glossy. The media includes Copper which inhibits the growth of *S. cerevisiae*. The growth of *E. coli* can be inhibited by adjusting the pH.

Wallerstein Differential NPS

Type 14046

Selective Media for the isolation and enumeration of bacteria encountered in breweries and industrial fermentations.

References

APHA (food)

Incubation Conditions

2–3 days at 25–30°C, aerobic (*E. coli*)
2–3 day at 25–30°C, anaerobic (*Lactobacilli*)
until 5 days for Inhibition

Evaluation and Typical Results

Lactobacillus brevis forms small green coloured colonies with sharp edge. *Lactobacillus plantarum* grow as small greenish or yellow coloured and round colonies with sharp edge. *E. coli* grow as white to cream coloured colonies with sharp edge. The growth of *S. cerevisiae* is inhibited by cycloheximid. If cycloheximide resistant yeast grow, they are creamy, green-white.

Raka Ray NPS

Type 14047

Selective medium for the isolation of lactic acid bacteria in beer and brewing processes (anaerobic).

References

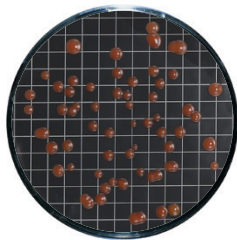
American Society of Brewery Chemists (ASBC),
European Brewing Convention (EBC)

Incubation Conditions

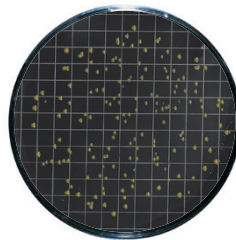
2–3 days at 25–30°C, anaerobic
until 5 days for inhibition

Evaluation and Typical Results

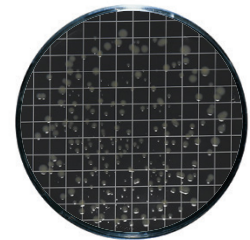
Lactobacilli grow as white or cream coloured colonies, round with sharp edge. Raka Ray NPS includes Cycloheximide, which inhibits the growth of *S. cerevisiae*. Selectivity against *E. coli* can be achieved by reconstitution of NPS with Phenylethanol 3,0g/l water.



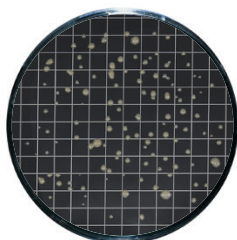
Rhodotorula mucilaginosa



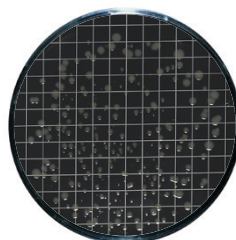
Lactobacillus brevis



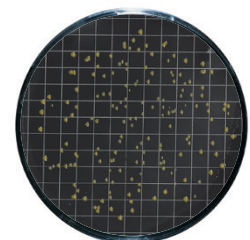
Lactobacillus plantarum



Candida albicans



Lactobacillus plantarum



Lactobacillus brevis

NBB NPS

Type 14048

For the detection of beer spoilage bacteria in brewery (anaerobic).

References

MEBAK, EBC

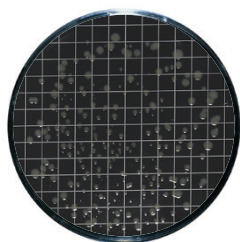
Incubation Conditions

5–7 days at 25–30°C, anaerobic

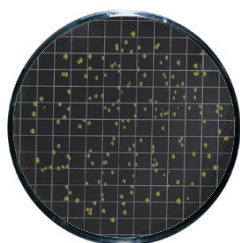
7–10 days at 25–30°C, anaerobic (*L. lindneri*)

Evaluation and Typical Results

Lactobacilli grow as small pale or cream coloured round colonies. Pediococci forms pale or yellowish coloured colonies. Candida forms cream coloured colonies with sharp edge, round and glossy. NBB NPS includes Cycloheximide, which inhibits the growth of *S. cerevisiae*.



Lactobacillus plantarum



Lactobacillus brevis

Troubleshooting Guide

If the directions for use are not being followed this may lead to unsatisfactory results listed below:

1. Inhibited Growth, Tiny Colonies

- Pad too dry: not enough water used

2. Colonies Run

- Pad too wet, water film on the membrane filter: too much water used.
- Colonies of motile microbes (such as *Bacillus* or *Proteus*) tend to run even though the water dosage is correct. To prevent this, add NaCl or an emulsifier.

3. Contamination from Underneath

Inhibited colony growth, excess ring of liquid cloudy, often including discoloration of the pad:

- Membrane placed with grid facedown on the pad instead of faceup
- Contamination during rehydration (by airborne microbes, by contact or by contaminated water)
- Contamination during preparation
- Microbes rinsed off the membrane filter by incomplete vacuum filtration of the sample or rinse liquid or by tilting the prepared petri dish
- Contaminated filter support
- Contaminated forceps

4. Growth on One Side Only

- Petri dish slanted in the incubator

5. Too Profuse or too Sparse Growth

(Optimum microbial number between 20 and 200 per filter)

- Wrong dilution selected or sample inadequately mixed with the diluent.

6. Non-uniform Growth

- Sample volume less than 5 mL filtered without adding sterile NaCl-buffer solution as a diluent or sample volume inadequately mixed with the diluent.

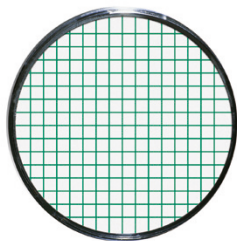
Membrane Filters for Use on Agar Plates or on Adsorbent Pads

If agar plates or adsorbent pads to be wetted with liquid culture medium are used instead of Nutrient Pad Sets, we recommend Sartorius cellulose nitrate (cellulose ester) membrane filters. These membranes are offered in a choice of three different colors to suit your specific test application, and provide a high-contrast background. For simple evaluation of the results, a grid divides the filtration area into 130 squares, each measuring 3.1 × 3.1 mm.

The membrane filters are available individually packaged and sterilized or packaged in a special designed individual package on a band for the use with the Microsart® E-motion membrane filter dispenser. The certificate included in every package documents the quality assurance tests as well as the compliance of the 0.45 µm membrane filters with ISO 7704.

Membrane Filters for Use on Agar Plates or on Absorbent Pads

For Detection of Bacteria in Dyed Media.



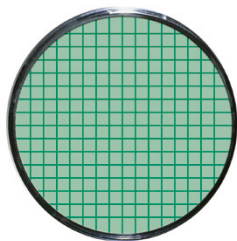
White Membrane with green Grid

Pore Size	Ø	Pckg. Size	Order No.
0.2 µm	47	100	11407-47-ACN*
	47	1,000	11407-47-ACR*
	50	100	11407-50-ACN*
	50	1,000	11407-50-ACR
0.45 µm	47	100	11406-47-ACN*
	47	1,000	11406-47-ACR*
	50	100	11406-50-ACN*
	50	1,000	11406-50-ACR
0.45 µm HighFlow	47	100	114H6-47-ACN
	47	1,000	114H6-47-ACR
	50	100	114H6-50-ACN
	50	1,000	114H6-50-ACR
0.65 µm	47	100	11405-47-ACN*
	50	100	11405-50-ACN
0.8 µm	47	100	11404-47-ACN*
	47	1,000	11404-47-ACR
	50	100	11404-50-ACN*
1.2 µm	47	100	11403-47ACN*
	47	1,000	11403-47ACR
	50	100	11403-50ACN*
	50	1,000	11403-50ACR

White Membrane with Green Grid

Pore Size	Ø	Pckg. Size	Order No.
0.45 µm	47	100	13906-47-ACN*
	47	1,000	13906-47-ACR*
	50	100	13906-50-ACN*
	50	1,000	13906-50-ACR*
0.45 µm HighFlow	47	100	139H6-47-ACN
	47	1,000	139H6-47-ACR
	50	100	139H6-50-ACN
0.65 µm	47	100	13905-47-ACN
1.2 µm	47	100	13903-47-ACN

Providing Optimal Contrast to Light-colored or Transparent Bacteria Colonies.



Green Membrane with Dark Green Grid

Pore Size	Ø	Pckg. Size	Order No.
0.45 µm	47	100	13806-47-ACN*
	47	1,000	13806-47-ACR*
	50	100	13806-50-ACN*
	50	1,000	13806-50-ACR*

For Detection of Yeasts and Molds.



Grey Membrane with White Grid

Pore Size	Ø	Pckg. Size	Order No.
0.45 µm	47	100	13006-47-ACN*
	47	1,000	13006-47-ACR*
	50	100	13006-50-ACN*
	50	1,000	13006-50-ACR
0.45 µm HighFlow	47	100	130H6-47-ACN
	47	1,000	130H6-47-ACR
	50	100	130H6-50-ACN
	50	1,000	130H6-50-ACR
0.65 µm	47	100	13005-47-ACN*
	50	100	13005-50-ACN*
	50	1,000	13005-50-ACR
0.8 µm	47	100	13004-47-ACN*
	47	1,000	13004-47-ACR
	50	100	13004-50-ACN*
8 µm	47	100	13001-47-N (non-sterile)
	50	100	13001-50-N (non-sterile)

HighFlow

The special pore structure of the 0.45 µm High-Flow membrane filters allow shorter filtration times due to higher flow rates and throughputs. Especially *E. coli* shows best growth promotion on HighFlow membranes. As every Sartorius 0.45 µm and 0.45 µm Highflow membrane filter lot these membranes are also **tested and released according to ISO 7704**.

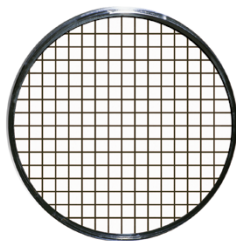
Prefilters, White Without Grid

11301, a white membrane filter with a pore size of 8 µm is used as a prefilter in a special prefilter attachment (16807) for bacteriological analyses. It retains coarse suspended particles, whereas it allows microorganisms to pass through. These microbes are trapped on the surface of the underlying bacteria-retentive membrane filter. Order no.: 11301--47----ACN and 11301--50----ACN.

* Also available as a non-sterile version. To order boxes with 100 pcs. replace ACN with N and for boxes of 1,000 pcs. replace ACR with R. Other types on request.

Membrane Filters for Use with Microsart® E-motion Dispenser

For Detection of Bacteria in Dyed Media.



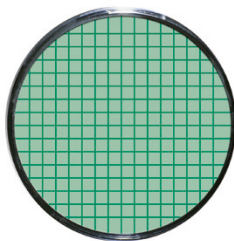
White Membrane with Black Grid

Pore Size	Ø	Pckg. Size	Order No.
0.2 µm	47	3 × 100	11407Z-47----SCM
	50	3 × 100	11407Z-50----SCM
0.45 µm HighFlow	47	3 × 100	114H6Z-47----SCM
	50	3 × 100	114H6Z-50----SCM
0.45 µm	47	3 × 100	11406Z-47----SCM
	50	3 × 100	11406Z-50----SCM
0.8 µm	47	3 × 100	11404Z-47----SCM
1.2 µm	47	3 × 100	11403Z-47----SCM
	50	3 × 100	11403Z-50----SCM

White Membrane with Green Grid

Pore Size	Ø	Pckg. Size	Order No.
0.45 µm	47	3 × 100	13906Z-47----SCM
	50	3 × 100	13906Z-50----SCM
0.45 µm HighFlow	47	3 × 100	139H6Z-47----SCM

Providing Optimal Contrast to Lightcolored or Transparent Bacteria Colonies.



Green Membrane with Dark Green Grid

Pore Size	Ø	Pckg. Size	Order No.
0.45 µm	47	3 × 100	13806Z-47----SCM
	50	3 × 100	13806Z-50----SCM

For Detection of Yeasts and Molds.



Grey Membrane with White Grid

Pore Size	Ø	Pckg. Size	Order No.
0.45 µm HighFlow	47	3 × 100	130H6Z-47----SCM
	50	3 × 100	130H6Z-50----SCM
0.45 µm	47	3 × 100	13006Z-47----SCM
	50	3 × 100	13006Z-50----SCM
0.65 µm	47	3 × 100	13005Z-47----SCM
	50	3 × 100	13005Z-50----SCM
0.8 µm	47	3 × 100	13004Z-47----SCM
	50	3 × 100	13004Z-50----SCM

HighFlow

The special pore structure of the 0.45 µm High-Flow membrane filters allow shorter filtration times due to higher flow rates and throughputs. Especially *E. coli* shows best growth promotion on HighFlow membranes. As every Sartorius 0.45 µm and 0.45 µm Highflow membrane filter lot these membranes are also **tested and released according to ISO 7704**.

Typical Application Examples

Product	Detection and Enumeration of...	Nutrient Pad Type
Beer	Lactobacilli and Pediococci and other beer spoiling organisms	VLB-S7-S, MRS , Wallerstein Differential, Raka Ray, NBB
	Total colony count	Standard, Standard TTC
	Wild yeasts	Lysine, Yeast+Mold plus Copper
	Yeasts and molds	Malt Extract*, Wallerstein Nutrient, Wort
Dairy	Latic Acid Bacteria Lactobacillaceae	MRS
Foods	Acid-tolerant microorganisms	Orange Serum
	Enterobacteria, E. coli and coliforms	Chromogenic Coliform (DIN EN ISO 9308-1), CHROMOCULT®**, ECD, Endo, (MacConkey), m FC, Teepol Lauryl Sulphate, Tergitol TTC
	Enterococci, Enterococcus faecalis	Azide KF Strep
	Lactobacilli	MRS
	Pseudomonas aeruginosa	Cetrimide
	Salmonellae	Bismuth Sulfite
	Staphylococci, Staphylococcus aureus	Chapman
	Thermophilic spore formers and mesophilic bacteria	Glucose Tryptone
	Total colony count	Caso, Standard, Standard TTC, TGE Tryptone Glucose Extract
	Yeasts and molds	Malt Extract, Wort
Food & beverage	Lactobacilli	MRS
Fruit juice	Enterobacteria, E. coli and coliforms	Endo, (MacConkey), Tergitol TTC*
	Lactobacilli	MRS
	Oenococcus and other product spoiling organisms	Jus de Tomate Tomato Juice, Orange Serum
	Yeasts and molds	Malt Extract, Schaufus Pottinger m Green yeast and mold, Wallerstein Nutrient, Wort
Milk	E. coli and coliforms	Endo
	Enterococci, Enterococcus faecalis	Azide KF Strep
	Salmonellae	Bismuth Sulfite
Pharmaceuticals, WFI, raw materials and cosmetics	Enterobacteria, E. coli	MacConkey
	Enterococci, Enterococcus faecalis	Azide KF Strep
	Pseudomonas aeruginosa	Cetrimide (cosmetics only)
	Staphylococci, Staphylococcus aureus	Chapman
	Total colony count	Caso, R2A
	Yeasts and molds, Candida albicans	Sabouraud
Soft drinks, concentrates	Acid-tolerant microorganisms, Lactic-acid bacteria	Orange Serum, VLB-S-7-S
	Enterobacteria, E. coli and coliforms	Endo, MacConkey
	Lactobacilli	MRS
	Mesophilic slime-forming bacteria, Leuconostoc	Weman
	Total colony count	Standard*, Standard TTC*, TGE Tryptone Glucose Extract
	Yeasts and molds	Malt Extract, Schaufus Pottinger m Green yeast and mold, Wallerstein Nutrient, Wort
Sugar, sugar products	E. coli and coliforms	Endo
	Mesophilic slime-forming bacteria, Leuconostoc	Weman
	Thermophilic spore formers and mesophilic bacteria	Glucose Tryptone
	Yeasts and molds	Malt Extract*, Schaufus Pottinger m Green yeast and mold, Wort*

Water (general quality), mineral water, natural water, waste water	Acid-tolerant microorganisms, Lactic-acid bacteria	Orange Serum
	Enterobacteria, E. coli and coliforms	Chromogenic Coliform (DIN EN ISO 9308-1), CHROMOCULT ^{®**} , ECD, Endo, (MacConkey), m FC, Teepol Lauryl Sulphate, Tergitol TTC
	Enterococci, Enterococcus faecalis	Azide KF Strep
	Pseudomonas aeruginosa	Cetrimide
	Salmonellae	Bismuth Sulfite
	Staphylococci, Staphylococcus aureus	Chapman
	Total colony count	Caso, R2A, Standard, Standard TTC, TGE Tryptone Glucose Extract, Yeast Extract
	Yeasts and molds, Candida albicans	Sabouraud
Wine	Acetobacter	Orange Serum, Wort (both wetted with 5 – 8% ethanol)
	Acid-tolerant microorganisms, Lactic-acid bacteria	Orange Serum
	Lactobacilli	MRS
	Oenococcus and other wine spoiling organ.	Jus de Tomate Tomato Juice
	Yeasts and molds	Malt Extract, Schaufus Pottinger m Green yeast and mold, Wallerstein Nutrient, Wort

* These NPS types are suitable for the determination of the mentioned microorganisms, although the media are not explicit declared in the references described in this publication.

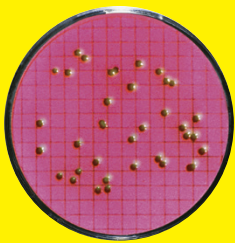
** Trade mark owner and manufacturer is Merck KGaA

Growth Comparison

The principle of the membrane filter method is based on the concentration of microorganisms from relatively large samples on the surface of a membrane filter. Nutrients and metabolites are exchanged through the pore system of the membrane filter.

The pore size alone is not a meaningful criterion. Due to the variance in allocation of the pores, not all membranes guarantee sufficient nutrient supply. A comparison of Sartorius cellulose nitrate (cellulose mixed ester) membranes with other mixed ester membranes reveals significant differences in growth promotion results.

Growth of *E. Coli* on Endo NPS



Cellulose nitrate membrane (mixed cellulose ester) filters from Sartorius

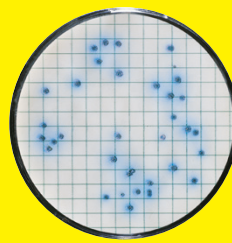
E. coli forms red colonies with a metallic sheen. Other coliforms would grow as dark to light red colonies without metallic sheen.



Mixed esters membrane from an alternative membrane supplier

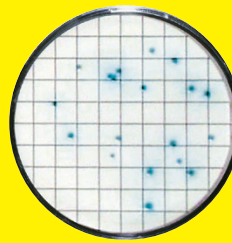
E. coli shows no metallic sheen on this mixed esters membrane. Therefore it is very difficult to differentiate between *E. coli* and coliforms without any further test. A quantitative statement is difficult due to the fact of running colonies on the mixed esters membrane surface.

Growth of *Pseudomonas Aeruginosa* on Cetrimide NPS



Cellulose nitrate membrane (mixed cellulose ester) filters from Sartorius

Pseudomonas aeruginosa forms blue, blue-green or yellow-green colonies with 1–2 mm diameter and blue zones. The colonies produce pyocyanin and fluorescein and show fluorescence in UV-light. Other *Pseudomonads* would develop colonies with different colors.



Mixed esters membrane from an alternative membrane supplier

On this mixed esters membrane grow less colonies and without the blue zone. Due to the variance in the allocation of the pores, here the mixed esters membrane did not guarantee a sufficient nutrient supply. This may cause in false negative results.

Accessories



Microsart® 3 branch Manifold plus Microsart® Funnel 100 and Microsart® E-jet Transfer Pump

Microsart® Funnel 100 | 250 are sterile 100 mL & 250 mL funnels. The optimal sealing is guaranteed by a click-fit closure. The large inner diameter ensures a high flow rate and the optimized shape allows a thorough rinsing of the system subsequent to the filtration. No liquid is retained in the funnel.



Microsart® 3 branch Manifold Plus Biosart® 250 Funnels

The Biosart® 250 Funnel has been designed for microbiological quality assurance in industry. The sterile 250 mL (50 mL graduations) plastic funnel guarantees fast filtration and high sample throughputs during routine testing. Its large inner diameter allows high flow rates, and the tapered inner wall permit thorough flushing of the funnel, after filtration.



Microsart® 3 branch Manifold Plus Biosart® 100 Monitors

Biosart® 100 Monitors are sterile disposables with an incorporated membrane filter and cellulose pad. They are ready-to-use and after filtration, the funnel will be removed, so the lid and the base fit to a petri dish. Each box contains 48 units with 47 mm, gridded membrane filters.

16A07--10-----N	Microsart® Funnel 100, sterile in bags, 100 units
16A07--25-----N	Microsart® funnel 250, sterile in bags, 96 units
166MP-4	Microsart® E-jet Liquid Transfer Pump
168M1-MS	Microsart® 1 branch Manifold for Microsart® Funnels
168M2-MS	Microsart® 2 branch Manifold for Microsart® Funnels
168M3-MS	Microsart® 3 branch Manifold for Microsart® Funnels
168M6-MS	Microsart® 6 branch Manifold for Microsart® Funnels

16407-25-ALK	Biosart® 250 Funnels, 50 units, sterile-packaged
16407-25-ACK	Biosart® 250 Funnels, 50 units, individually sterile-packaged
168M3-BS250	Microsart® 3 branch Manifold for Biosart 250 Funnels
168M6-BS250	Microsart® 6 branch Manifold for Biosart 250 Funnels

16401-47-07-ACK	Biosart® 100 Monitor, individually sterile-packaged, 0.2 µm, white black grid
16401-47-06-ACK	Biosart® 100 Monitor, individually sterile-packaged, 0.45 µm white black grid
16402-47-06-ACK	Biosart® 100 Monitor, individually sterile-packaged, 0.45 µm green dark green grid
16403-47-06-ACK	Biosart® 100 Monitor, individually sterile-packaged, 0.45 µm grey white grid
168M1-BS100	Microsart® 1 branch Manifold for Biosart® 100 Monitors
168M2-BS100	Microsart® 2 branch Manifold for Biosart® 100 Monitors
168M3-BS100	Microsart® 3 branch Manifold for Biosart® 100 Monitors
168M6-BS100	Microsart® 6 branch Manifold for Biosart® 100 Monitors



Combisart® Individual Systems and Filter Holders

For low number of samples to test, the individual system is ideal to use. In this equipment set-up, you simply use a silicone stopper and a single base to fit your choice of funnel type on a suction flask.

Vacuum Pumps, Liquid Transfer Pump, Water Traps and Vacuum Hose

The vacuum pumps are neoprene membrane pumps with low noise level, oil- and maintenance-free, reliable sources of vacuum. The water traps are preventing an overflow of filtrate into the vacuum pump.

Stainless Steel Prefilter Attachment

For removal of coarse particulate substances from samples in a single step along with bacteria-retentive filtration for subsequent microbiological testing. Clips between a filter support of a Microsart® Manifold and a stainless steel funnel (as show at the photo) or Biosart® 250 Funnel. Autoclavable and can be flamed.

16841	Stainless steel single base
6981065	Stainless steel funnel, 100 mL
6981002	Stainless steel funnel, 500 mL
17575-----ACK	Minisart® SRP 25, 50 sterile venting filters
17173	Silicone stopper
16672	Suction flask 2 Liter

Alternatively to position 1–3 you can use 16219-CS as 100 mL filter holder or 16201-CS as 500 mL filter holder.

16694-2-50-22	Microsart® Maxi-vac for multiple filtration runs, 230 V, 50 Hz
16694-1-60-22	Microsart® Maxi-vac, for multiple filtration runs 115 V, 60 Hz
16694-2-50-06	Microsart® Mini-vac for single filtration run, 230 V, 50 Hz
16694-1-60-06	Microsart® Mini-vac, for single filtration run 115 V, 60 Hz
17804-M	Vacusart®, water trap 3 individually sterile-packaged PTFE filter
16610	Woulff's bottle, 500 mL, with stop cock
16623	Rubber vacuum hose, 1 m

The Liquid Transfer pump saves place at the lab bench as no suction flask and water trap is needed.

166MP-4	Microsart® E-jet Liquid Transfer Pump
1ZA---0006	Vacuum tubing between manifold and Microsart® E-jet pump, silicone, length 20 cm
1ZAS--0007	Silicone tubing, pressure sided, length 1 m
1ZAS--0019	Silicone tubing, pressure sided, length 2 m

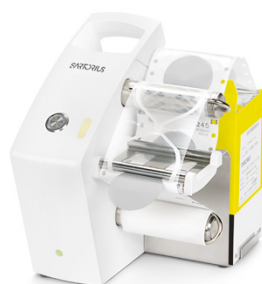
16807	Prefilter attachment
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Prospenser

The most convenient way to moist the NPS with water is to use a Prospenser with an adapted Minisart syringe filter. Simultaneous sterilization and dosing of demineralized water in 3.5 mL steps is easy done by screwing the Prospenser on a glass bottle filled with water.

LH-723072	Prospenser Plus, 1 – 5 mL
LH-721653	Dispensing head (luer lock)
17597-----K	Minisart® syringe filter, 0.2 µm, individually sterile-packaged



Microsart® E-motion Dispenser – Membrane Filters on Demand

The completely new membrane filter dispenser meets all requirements placed on advanced laboratory equipment. The membrane filters are released from their sterile packaging fully automatically at the touch of a button or hands-free – a dispensing operation is triggered when the optical sensor detects approaching tweezers.

16713----BO	Microsart® E-motion Dispenser, battery or power supply operated
16713----PS	Microsart® E-motion Dispenser, power supply operated



Microsart® E-motion Membrane Filters

The cellulose nitrate (cellulose mixed ester) membranes suitable for the use in dispensers are sterile-sealed, without protective paper on top of each filter, in a specially designed individual package on a band. The special pleating of the band of membrane filter units ensures that they are perfectly flat when dispensed. The shape of the sealed band guarantees uniform dispensing of the individual membrane filters.

11407Z-47----SCM	White black, 0.2 µm
114H6Z-47----SCM	White black, 0.45 µm High Flow
11406Z-47----SCM	White black, 0.45 µm
139H6Z-47----SCM	White green, 0.45 µm High Flow
13906Z-47----SCM	White green, 0.45 µm
13806Z-47----SCM	Green dark green, 0.45 µm
13006Z-47----SCM	Gray white, 0.45 µm
130H6Z-47----SCM	Gray white, 0.45 µm High Flow
13005Z-47----SCM	gray white, 0.65 µm

Technical Data and Application Guide Nutrient Pad Sets

Counting of Total Colony Forming Units

Detection Target and Reference ¹	Test Sample Materials	Media Type (pH) Order No. (Filter Type) ^{2,3}	Recom. Incubation Conditions ⁴
Total count APHA (dairy), APHA (food), APHA (water), AOAC, DAB, EG 98/83, EP, FDA, IDF, ISO 7704, ISO 8199, ISO 9308-1 [1990], ISO 9308-1 [2001], USDA, USP	Pharmaceuticals, cosmetics, raw materials, water (general quality), waste water, foods, other products	Caso (pH 7.3) 14063--47-----N (1)	Bacteria: ≤3 d at 30 – 35 °C; Yeasts and molds: ≤5 d at 30 – 35 °C
Total count APHA (water), EP, ISO 7704	Water for pharma purpose, water (general quality), waste water, other products	R2A (pH 7.2) 14084--47-----N (1) 14084--47----RDN	≥5 d at 30 – 35 °C
Total count APHA (water), ISO 7704, VLB	Raw materials, water (general quality), waste water, beverages, beer, foods, other products	Standard (pH 7.2) 14064--47-----N (1)	≤5 d at 30 – 35 °C
Total count APHA (water), ISO 7704, VLB	Raw materials, water (general quality), natural water, waste water, beverages, beer, foods, other products	Standard TTC (pH 7.2) 14055--47-----N (1)	≤5 d at 30 – 35 °C
Total count APHA (water), ISO 7704, VLB	Raw materials, water (general quality), natural water, waste water, beverages, beer, foods, other products	Standard TTC I mod. (pH 7.2) 14085--47-----N (1) 14085--47----RDN	≤5 d at 30 – 35 °C
Total count APHA (dairy), APHA (food), APHA (water), API, ISO 7704	Raw materials, water (general quality), natural water, waste water, beverages, soft drinks, concentrates, foods, other products	TGE Tryptone Glucose Extract (pH 7.0) 14076--47-----N (1) 14076--47----RDN	≤5 d at 30 – 35 °C
Total count EG 98/83, HMSO, ISO 6222, ISO 7704, ISO 8199	Water (general quality), natural water, other products	Yeast Extract (pH 7.2) 14090--47-----N (1)	44 ±4 h at 36 ±2 °C; 68 ±4 h at 22 ±2 °C



Shelf Life	Test Strains ⁵
24	01, 03, 05, 09, 18, 22, 25, 26
24	01, 03, 05, 09, 18, 22, 26
24	03, 07, 09, 18, 26
24	03, 07, 09, 18, 26
24	03, 07, 09, 18, 26
24	07, 09, 18, 26
24	03, 07, 09, 18, 26

1) Reference Guide on page 38.

2) A Set contains 100 Nutrient Pads and 100 membrane filters, both individually, sterile-packaged. The membrane filters are selected for optimum growth together with the corresponding nutrient media. The supplied membrane filter type is listed within brackets:

- (1) = green with dark green grid, 0.45 µm pore size
- (2) = white with green grid, 0.45 µm pore size
- (3) = gray (after wetting black) with white grid, 0.65 µm pore size
- (4) = white with green grid, 0.65 µm pore size
- (5) = white with green grid, 1.2 µm pore size
- (6) = gray (after wetting black) with white grid, 0.8 µm pore size
- (7) = white with black grid, 0.45 µm pore size
- (8) = gray (after wetting black) with white grid, 0.45 µm pore size
- (9) = white with green grid, 0.45 µm pore size, High Flow (ideal for E. coli)
- (10) = gray (after wetting black) with white grid, 0.45 µm pore size, High Flow

3) Diameter of the membrane filter, 47 mm.
Order number for Nutrient Pad Sets with 50 mm membrane filter as above, but --47-----N replaced by --50-----N.
Most of the NPS types are also available with Microsart® E-motion Membrane Filters: Order number as above, but ---N replaced by -RDN.

Other NPS types and NPS with Microsart® E-motion Membrane Filters on request.

4) The incubation conditions are recommended by Sartorius. They may be varied according to the type of samples in compliance with the reference standard or customer's requirements.

5) Test strains on page 36.



E. Coli and Coliforms, Enterobacteria

Detection Target and Reference ¹	Test Sample Materials	Media Type (pH) Order No. (Filter Type) ^{2,3}	Recom. Incubtion Conditions ⁴
E.coli and coliforms ISO 9308-1 (2014), ISO 7704	Water (general quality), natural water, bottled water, other products	Chromogenic coliform (pH 6.8) 14049--47-----N 14049--47----RDN	18 – 24 h at 36 ±2 °C
Total count APHA (water), EP, ISO 7704	Raw materials, water (general quality), waste water, beverages, foods, other products	CHROMOCU LT®* (pH 7.0) 14087--47-----N (7) 14087--47----RDN	20 – 28 h at 36 ±2 °C
Total count APHA (water), ISO 7704, VLB	Raw materials, water (general quality), waste water, beverages, foods, other products	ECD (pH 7.0) 14082--47-----N (2)	16 – 18 h at 44 ±2 °C
Total count APHA (water), ISO 7704, VLB	Raw materials, water (general quality), natural water, waste water, beverages, soft drinks, concentrates, fruit juice, sugar, sugar products, foods, other products	Endo (pH 7.4) 14053--47-----N (9) 14053--47----RDN	18 – 24 h at 36 ±2 °C
Total count APHA (water), ISO 7704, VLB	Raw materials, water (general quality), waste water, beverages, foods, other products	m FC (pH 7.4) 14068--47-----N (2) 14068--50----PDN (closed petri dishes) (2)	18 – 24 h at 36 ±2 °C
Total count APHA (dairy), APHA (food), APHA (water), API, ISO 7704	Pharmaceuticals, cosmetics, raw materials, water (general quality), natural water, waste water, beverages, soft drinks, concentrates, fruit juice, foods, other products	MacConkey (pH 7.1) 14097--47-----N (2)	18 – 72 h at 30–35 °C
E. coli and coliforms AFNOR, APHA (water), BS, FDA, ISO 7704, ISO 9308-1 [1990], USDA	Water (general quality), waste water, beverages, foods, other products	Teepol Lauryl Sulphate (pH 7.2) 14067--47-----N (2) 14067--47----RDN	18 – 24 h at 36 ±2 °C
E. coli and coliforms APHA (food), EG 98/83, ISO 7704, ISO 8199, ISO 9308-1 [1990], ISO 9308-1 [2001]	Raw materials, water (general quality), waste water, beverages, foods, other products	Tergitol TTC (pH 8.0) 14056--47-----N (2) 14056--47----RDN	18 – 24 h at 36 ±2 °C

Other Faecal Bacteria

Detection Target and Reference ¹	Test Sample Materials	Media Type (pH) Order No. (Filter Type) ^{2,3}	Recom. Incubtion Conditions ⁴
Enterococci APHA (food), APHA (water), EG 98/83, HMSO, ISO 7704, ISO 7899-2, ISO 8199, LMBG, MNO	Raw materials, water (general quality), natural water, waste water, beverages, foods, other products	Azide KF Strep (pH 7.2 ±0.1) 14051--47-----N (1) 14051--47----RDN	40 – 48 h at 36 ±2 °C
Salmonellae AFNOR, APHA (dairy), APHA (food), AOAC, DGHM, FDA, HMSO, IDF, ISO 6579 [1981], ISO 7704, USDA	Pharmaceuticals, cosmetics, raw materials, water (general quality), waste water, foods, other products	Bismuth Sulfite (pH 7.6) 14057--47-----N (1)	40 – 48 h at 36 ±2 °C

Shelf Life	Test Strains ⁵
24	06, 07, 09, 11, 28, 32, 33
24	06, 09, 11, 21, 25
24	06, 09, 19, 21, 33
24	06, 07, 09, 21, 25, 28
24	06, 07, 09, 11, 25
24	02, 06, 09, 21, 25, 26
24	06, 07, 09, 11, 21
24	06, 07, 09, 11, 22

Shelf Life	Test Strains ⁵
24	07, 09, 26, 28, 32, 36, 37, 38, 39
24	03, 09, 21, 25

1) Reference Guide on page 38.

2) A Set contains 100 Nutrient Pads and 100 membrane filters, both individually, sterile-packaged. The membrane filters are selected for optimum growth together with the corresponding nutrient media. The supplied membrane filter type is listed within brackets:

- (1) = green with dark green grid, 0.45 µm pore size
- (2) = white with green grid, 0.45 µm pore size
- (3) = gray (after wetting black) with white grid, 0.65 µm pore size
- (4) = white with green grid, 0.65 µm pore size
- (5) = white with green grid, 1.2 µm pore size
- (6) = gray (after wetting black) with white grid, 0.8 µm pore size
- (7) = white with black grid, 0.45 µm pore size
- (8) = gray (after wetting black) with white grid, 0.45 µm pore size
- (9) = white with green grid, 0.45 µm pore size, High Flow (ideal for E. coli)
- (10) = gray (after wetting black) with white grid, 0.45 µm pore size, High Flow

3) Diameter of the membrane filter, 47 mm.
Order number for Nutrient Pad Sets with 50 mm membrane filter as above, but --47-----N replaced by --50-----N.
Most of the NPS types are also available with Microsart® E-motion Membrane Filters: Order number as above, but ---N replaced by -RDN.

Other NPS types and NPS with Microsart® E-motion Membrane Filters on request.

4) The incubation conditions are recommended by Sartorius. They may be varied according to the type of samples in compliance with the reference standard or customer's requirements.

5) Test strains on page 36.

* Trade mark owner and manufacturer is Merck KGaA

Non-faecal, Pathogenic Bacteria

Detection Target and Reference ¹	Test Sample Materials	Media Type (pH) Order No. (Filter Type) ^{2,3}	Recom. Incubtion Conditions ⁴
Pseudomonas aeruginosa APHA (water), AOAC, ASM, DIN 38411, EG 98/83, FDA, ISO 7704, ISO 8199, ISO 16266	Cosmetics, raw materials, water (general quality), waste water, foods, other products	Cetrimide (pH 7.1) 14075--47-----N (2) 14075--47----RDN	40–48 h at 36 ±2 °C
Staphylococci, Staph. aureus APHA (food), AOAC, DGHM, FDA, HMSO, ISO 7704, USP	Pharmaceuticals, cosmetics, raw materials, water (general quality), waste water, foods, other products	Chapman (pH 7.4) 14074--47-----N (2)	18–72 h at 30–35 °C

Yeasts and Molds

Detection Target and Reference ¹	Test Sample Materials	Media Type (pH) Order No. (Filter Type) ^{2,3}	Recom. Incubtion Conditions ⁴
Wild yeasts Journal Institute of Brewing, VLB	Beer, other products	Lysine (pH 5.0) 14061--47-----N (3)	3–5 d at 30–35 °C
Wild yeasts	Beer	Yeast+Mold Plus Copper (pH 4.0) 14045--47-----N 14045--47----RDN	3–5 d at 25–30 °C, aerobic
Yeasts and molds APHA (food), AOAC, IFU	Beverages, wine, soft drinks, concentrates, fruit juice, foods, other products	Malt Extract (pH 4.5) 14086--47-----N (6) 14086--47----CCN (8)	3–5 d at 20–25 °C or at 30–35 °C depending on the target of the investigation
Yeasts and molds APHA (food), AOAC, EP, USP	Pharmaceuticals, cosmetics, raw materials, water (general quality), waste water, other products	Sabouraud (pH 5.6) 14069--47-----N (10)	≤5 d at 20–25 °C
Yeasts and molds	Wine, soft drinks, concentrates, sugar, sugar products, other products	Schaufus Pottinger m Green yeast and mold (pH 4.3) 14070--47-----N (4) 14072--47-----N (5) 14080--47-----N (6) 14080--47----RDN 14083--47-----N (3) 14091--47-----N (8) 14091--47----RDN	2–5 d at 20–25 °C or at 30–35 °C depending on the target of the investigation
Yeasts and molds and bacteria ISO 7704	Beverages, beer, wine, soft drinks, concentrates, fruit juice, other products	Wallerstein WL Nutrient (pH 5.5) 14089--47-----N (2)	2–5 d at 30–35 °C aerobic or anaerobic depending on the target of the investigation
Yeasts and molds VLB	Raw materials, beverages, beer, wine, soft drinks, concentrates, foods, other products	Wort (pH 4.4) 14058--47-----N (3) 14092--47----RDN (8)	3–5 d at 20–25 °C or at 30–35 °C depending on the target of the investigation

Shelf Life	Test Strains ⁵
24	07, 09, 22, 28, 30, 32, 33
24	07, 09, 21, 26, 27
Shelf Life	Test Strains ⁵
24	05, 20, 23, 24
24	01, 05, 23, 24, 28
24	05, 20, 23, 24
24	01, 05, 20, 23, 24
24	03, 05, 20, 23, 24
24	05, 12, 19, 20, 23, 29
24	05, 20, 23, 24

1) Reference Guide on page 38.

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- (4) = white with green grid, 0.65 µm pore size
- (5) = white with green grid, 1.2 µm pore size
- (6) = gray (after wetting black) with white grid, 0.8 µm pore size
- (7) = white with black grid, 0.45 µm pore size
- (8) = gray (after wetting black) with white grid, 0.45 µm pore size
- (9) = white with green grid, 0.45 µm pore size, High Flow (ideal for E. coli)
- (10) = gray (after wetting black) with white grid, 0.45 µm pore size, High Flow

3) Diameter of the membrane filter, 47 mm.
Order number for Nutrient Pad Sets with 50 mm membrane filter as above, but --47-----N replaced by --50-----N.
Most of the NPS types are also available with Microsart® E-motion Membrane Filters: Order number as above, but ---N replaced by -RDN.

Other NPS types and NPS with Microsart® E-motion Membrane Filters on request.

4) The incubation conditions are recommended by Sartorius. They may be varied according to the type of samples in compliance with the reference standard or customer's requirements.

5) Test strains on page 36.

Product-spoiling Microorganisms

Detection Target and Reference ¹	Test Sample Materials	Media Type (pH) Order No. (Filter Type) ^{2,3}	Recom. Incubtion Conditions ⁴
Thermophilic spore formers and mesophilic bacteria APHA (dairy), APHA (food), AOAC, ICUMSA, IFU, ISO 7704, NCA	Fruit juice, sugar, sugar products, foods, other products	Glucose Tryptone (pH 6.8) 14066--47-----N (2)	18 – 72 h at 30 – 35 °C for mesophilic bacteria; 48 – 72 h at 55 ±2 °C for thermophilic sporulating microorganisms
Leuconostoc oenos and other wine spoiling organisms ISO 7704, Lanaridris& Lafon-Lafourcade	Wine, fruit juice, other products	Jus de Tomate Tomato Juice (pH 5.0) 14079--47-----N (1)	5 – 7 d at 30 – 35 °C anaerobic (microaerophil); control for slowly growing microorganisms after 10 d is recommended
Acid-tolerant microorganisms APHA (water), IFU, ISO 7704, MPP (packaging staff)	Raw materials, water (general quality), waste water, wine, soft drinks, concentrates, fruit juice, foods, other products	Orange Serum (pH 5.5) 14062--47-----N (1) 14062--47----RDN	3 – 5 d at 30 – 35 °C aerobic or anaerobic depending on the target of the investigation
Acid-tolerant microorganisms APHA (water), IFU, ISO 7704, MPP (packaging staff)	Raw materials, water (general quality), waste water, wine, soft drinks, concentrates, fruit juice, foods, other products	Orange Serum (pH 3.2) 14096--47-----N (6) 14096--47----RDN	3 – 5 d at 30 – 35 °C aerobic or anaerobic depending on the target of the investigation
Lactobacilli and Pediococci and other beer spoiling organisms EBC, ISO 7704, MEBAC, VLB	Beer, other products	VLB-S7-S (pH 5.5) 14059--47-----N (2)	3 – 5 d at 30 – 35 °C anaerobic (microaerophil)
Lactobacilli and other beer spoiling microorganisms	Beer	Wallerstein Differential (pH 5.5) 14046--47-----N 14046--47----RDN	3 – 5 d at 25 – 30 °C, aerobic
Lactobacilli APHA, ISO	Fruit juice, beer, diary, foods, soft drinks, other materials	MRS (pH 6.1) 14077--47-----N (1)	3 – 5 d at 30 °C under anaerobic conditions (microaerophil)
Lactic acid bacteria in beer and brewing processes (anaerobic)	Beer	Raka Ray (pH 5.4) 14047--47-----N 14047--47----RDN	5 days at 25 – 30 °C, anaerobic
Beer spoilage bacteria in brewery (anaerobic)	Beer	NBB (pH 5.8) 14048--47-----N 14048--47----RDN	5 days at 25 – 30 °C, anaerobic
Mesophilic slime-forming bacteria esp. Leu. Mesenteroides ICUMSA, ISO 7704	Soft drinks, concentrates, sugar, sugar products, other products	Weman (pH 5.5) 14065--47-----N (1)	5 days at 30 – 35 °C

Test Strains [ATCC No.], [DSM No.]

1. *Aspergillus brasiliensis* 16404, 1988
2. *Bacillus cereus* 11778, 345
3. *Bacillus subtilis* subsp. *spizizenii* 6633, 347
4. *Brevundimonas diminuta* 19146, 1635
5. *Candida albicans* 10231, 1386
6. *Enterobacter aerogenes* 13048, 30053
7. *Enterococcus faecalis* 29212, 2570
8. *Enterococcus faecium* 19434, 20477
9. *Escherichia coli* 8739, 1576
10. *Geobacillus stearothermophilus* 7953, 5934
11. *Citrobacter freundii* 43864, 24397
12. *Lactobacillus lindneri* DSM 20690
13. *Lactobacillus plantarum* subsp. *plantarum* 14917, 20174
14. *Leuconostoc mesenteroides* subsp. *mesenteroides* 8293, 20343
15. *Oenococcus oeni* 23279, 20252
17. Raw cane sugar solution (10 % or 20 %)
18. Tap water
19. *Pediococcus damnosus* 29358, 20331
20. *Penicillium commune* 10428, 2211
21. *Proteus mirabilis* 29906, 4479
22. *Pseudomonas aeruginosa* 9027, 1128
23. *Rhodotorula mucilaginosa* DSM 70403
24. *Saccharomyces cerevisiae* 9763, 1333
25. *Salmonella enterica* subsp. *enterica* serotype typhimurium 14028, 19587
26. *Staphylococcus aureus* subsp. *aureus* 6538, 799
27. *Staphylococcus epidermidis* 12228, 1798
28. *Escherichia coli* 25922, 1103
29. *Lactobacillus brevis* 14869, 20054
30. *Pseudomonas aeruginosa* 27853, 1117
31. *Lactobacillus acidophilus* 4356, 20079
32. *Enterococcus faecalis* 19433, 20478
33. *Pseudomonas aeruginosa* 10145, 50071
34. *Lactobacillus plantarum* 8014, 20205
35. *Lactobacillus fermentum* ATTC 9338
36. *Enterococcus faecalis* DSM 24916
37. *Enterococcus faecium* 6057, 2146
38. *Enterococcus faecium* WDCM 00178
39. *Staphylococcus aureus* 25923, 1104

Shelf Life	Test Strains ⁵
24	02, 09, 10, 17, 26
24	12, 14, 15, 24
24	02, 05, 13, 14, 20, 23, 24
24	02, 05, 13, 14, 20, 23, 24
24	06, 12, 13, 19, 24, 29
24	24, 28, 29, 34
24	13, 19, 22, 29, 31
24	24, 28, 29, 34, 35
24	05, 12, 19, 24, 29, 34
24	14

1) Reference Guide on page 38.

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- (7) = white with black grid, 0.45 µm pore size
- (8) = gray (after wetting black) with white grid, 0.45 µm pore size
- (9) = white with green grid, 0.45 µm pore size, High Flow (ideal for E. coli)
- (10) = gray (after wetting black) with white grid, 0.45 µm pore size, High Flow

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5) Test strains on page 36.



Remarks

The incubation conditions are recommended by Sartorius. They may be varied according to the type of samples in compliance with the reference standard or customer's requirements. The description of the typical results or any pictures show typical appearance of the mentioned microorganisms. In particular cases, color and shape of the colonies could vary from the expected habitus. Further tests may be necessary to validate the result. Sartorius shall not be liable for consequential and/or incidental damage sustained by any customer from the use of its products. Nutrient Pad Sets (NPS) are subject to continuous product improvement as part of our product development program to align our products with changing application requirements.

Reference Guide

The compositions of the pads are based on the recommendations of numerous different standards and regulations.

Abbreviation	Title
AFNOR	Association Franchise de Normalisation
APHA (dairy)	American Public Health Association: Standard Methods for the examination of dairy products
APHA (food)	American Public Health Association: Compendium of methods for the microbiological examination of foods
APHA (water)	American Public Health Association, American Water Works Association (AWWA) and Water Environment Federation (WEF): Standard Methods for the Examination of Water and Waste Water
AOAC	Association of Official Analytical Chemists
API	American Petroleum Institute: Recommended practice for biological Analysis of Subsurface Injection waters
ASM	American Society for Microbiology
BS	British Standards
DAB	Deutsches Arzneimittelbuch (German Pharmacopoeia, replaced by EP)
DIN 10110	Deutsches Institut für Normung: Mikrobiologische Fleischuntersuchung. Bestimmung der E. coli. (Microbial detection of E. coli on meat)
DIN 38411	Deutsches Institut für Normung: Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung (German standard for water, waste water and sludge analysis)
DGHM	Deutsche Gesellschaft für Hygiene und Mikrobiologie (German Association of Hygiene and Microbiology)
EBC	European Brewery Convention
EG 98/83	European Guideline 98/83: Water Quality for human purpose
EP	European Pharmacopoeia
EPA	U.S. Environmental Protection Agency: Laboratory standards for equipment and materials
FDA	U.S. Federal Drug Administration
HMSO	Her Majesty's Stationery Office: Department of Health and Social Security (1982) "The Bacteriological Examination of Drinking Water Supplies". Report 71, HMSO, London
ICUMSA	International Commission for Uniform Methods of Sugar Analysis
IDF	International Dairy Federation
IFU	International Federation of Fruit Juice Producers
ISO 6222	International Organization for Standardization: Water Quality - Enumeration of culturable micro-organisms
ISO 6579-1981	International Organization for Standardization: Microbiology. General guidance on methods for the detection of Salmonella. Reference method
ISO 7704	International Organization for Standardization: Water Quality, Evaluation of membrane filters used for microbiological analysis

ISO 7899-2	International Organization for Standardization: Water Quality – Detection and enumeration of intestinal enterococci
ISO 8199	International Organization for Standardization: Water Quality – General Guide to the enumeration of micro-organisms by culture
ISO 9308-1	International Organization for Standardization: Water Quality – Detection and enumeration of E. coli and coliform bacteria
EN ISO 16266	European International Organization for Standardization: Water Quality – Detection and enumeration of Ps. aeruginosa
JFoodP	Journal of Food Protection
JIBrew	The Journal of the Institute of Brewing
LLL	Method described by Lanaridris& Lafon-Lafourcade
LMBG	Amtliche Sammlung von Untersuchungsverfahren nach dem §35 des Lebensmittel- und Bedarfsgegenständegesetzes des BGA (testing procedures for food stuffs and articles of daily use)
MEBAK	Methodensammlung der Mitteleuropäischen Brauereitechnischen Analysenkommission (methods of the Central European brewery commission)
MNO	Verordnung über natürliches Mineralwasser, Quellwasser und Tafelwasser (Mineral/Table Water Guideline)
MPP	Merkblätter für die Prüfung von Packmitteln (Testing procedures for packaging stuff)
NCA	National Canners Association: A Laboratory manual of the canning industry
USDA	U.S. Department of Agriculture
USP	United States Pharmacopoeia
VLB	Versuchs- und Lehranstalt für Brauerei in Berlin (institute of brewery)
ZenHyg	Zentralblatt für Hygiene (Journal of Hygiene)

DIN standards and the „Amtliche Sammlung von Untersuchungsverfahren nach dem §35 des Lebensmittel- und Bedarfsgegenständegesetzes des BGA“ are available through the German publisher Beuth-Verlag, Burggrafenstr. 6, 10787 Berlin



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