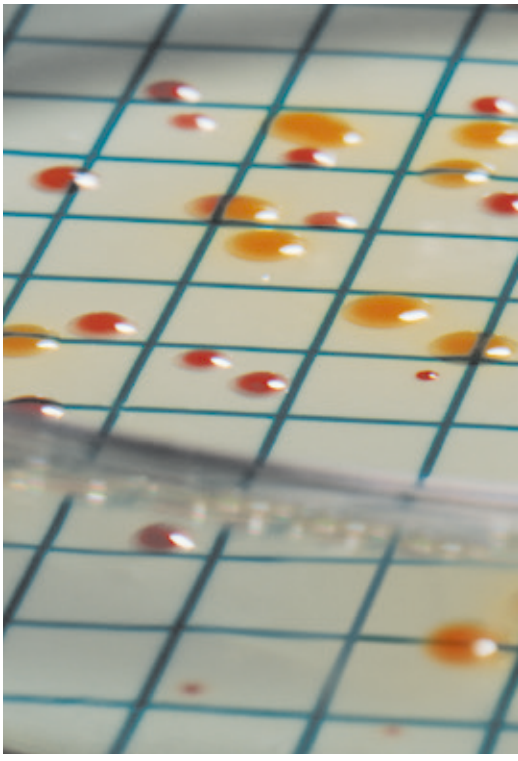
sartorius

Microbiological Testing of Foods, Beverages, Drinking Water and Pharmaceuticals



turning science into solutions

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.

Contents

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.

For the Monitor MF-Methode the monitor is ready to use due to a pre-asembled membrane and pad inside.

The nutrient media is added from the top and sucked into the pad by a short vacuum (< 1 sec.) After removal of the funnel the lid and the base fit to a petri dish.

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:

- Proofen 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 Stedim Biotech 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.

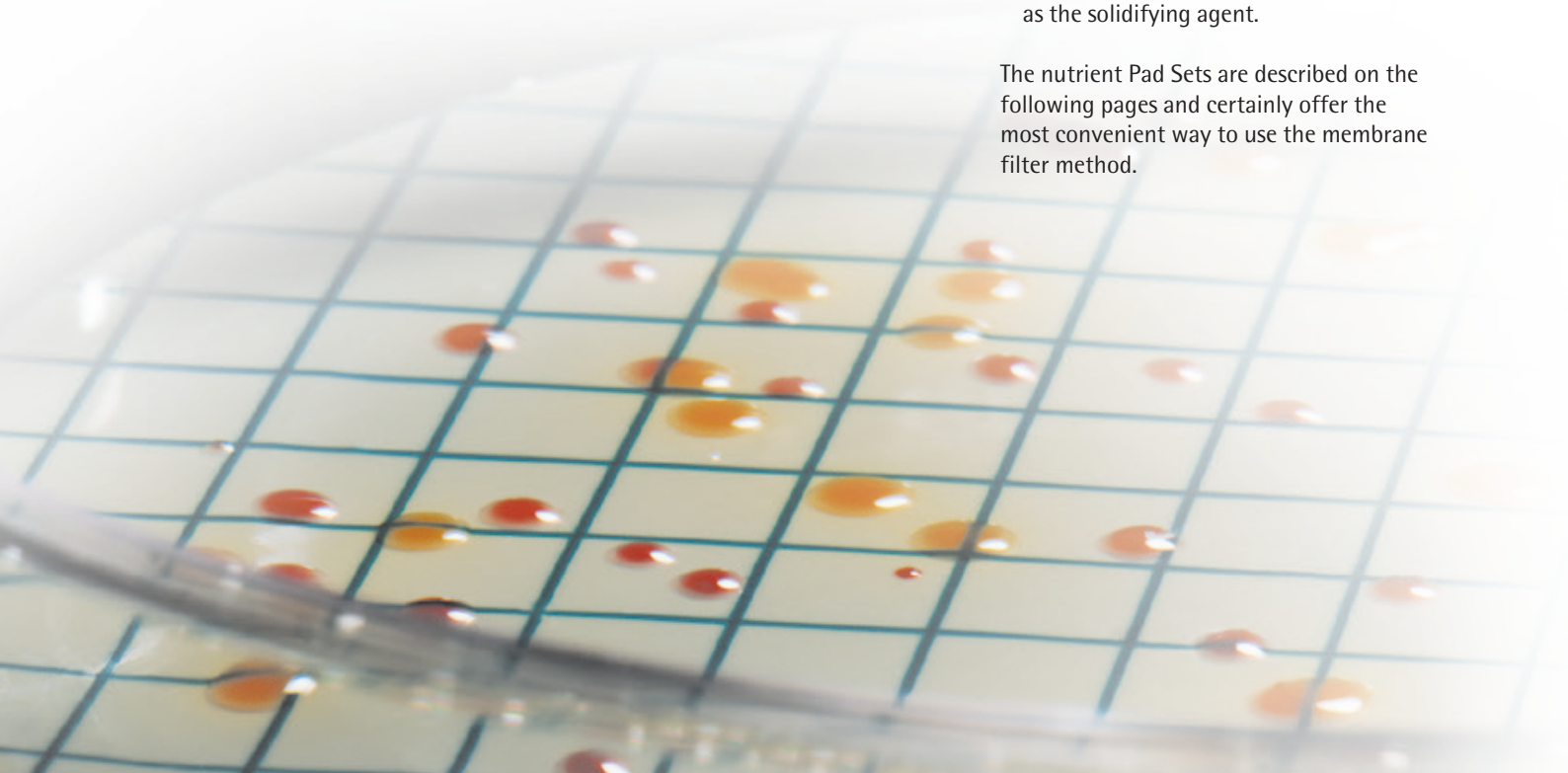
For detecting microorganisms in cultures, liquid and solid culture media are employed. Microorganisms are concentrated by growth in or on these culture media.

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:

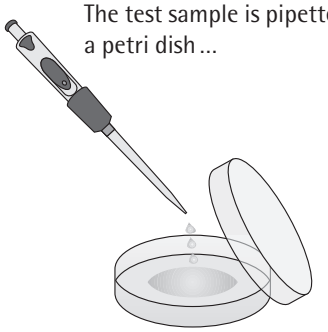
- **Nutrient Pad Sets**
  Nutrient Pad Sets definitely optimize the membrane filter method.
  They standardize microbiological test procedures, making them much more efficient.
  The simplify laboratory work.
  They help to save time and money.
- Absorbent pads to be wetted with culture media.
- Culture 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.

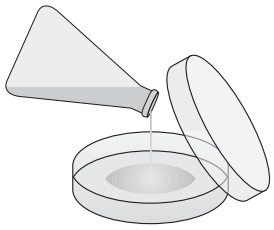


Direct Method

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



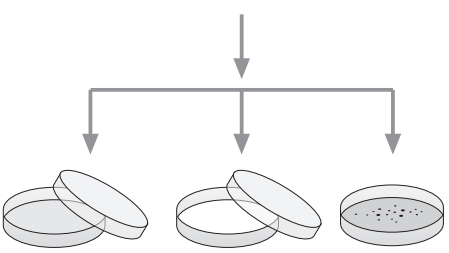
... then mixed with the culture medium and incubated



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.

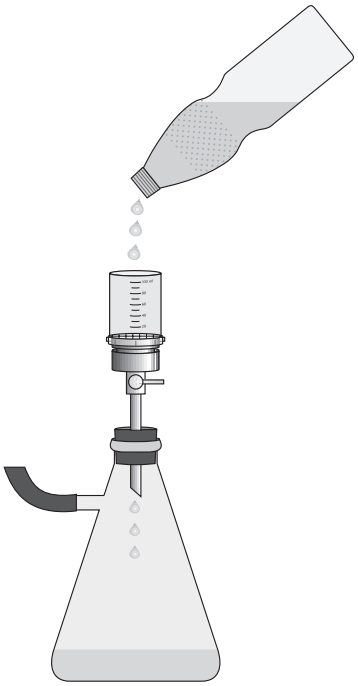


a) on a nutrient pad wetted with sterile water

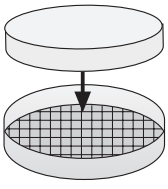
b) on an absorbent pad wetted with liquid culture medium

c) on an agar plate

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.



For further information on Sartorius Stedim Biotech Biosart 100 Monitors, please refer to the publications SM-1013-e

Nutrient Pad Sets

Sartorius Stedim Biotech Nutrient Pad Sets have been used successfully in the membrane filter method for over 20 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 destilled 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 Stedim Biotech Dosing Syringe and an attached Syringe Filter Holder (0.2 µm) or with an ampoule with sterile water.	**– 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 growth-promoting 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**

How to Use Nutrient Pad Sets

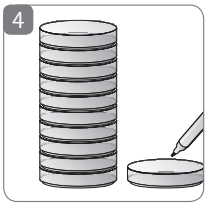
It's so easy to use Nutrient Pad Sets: NPS and go

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.

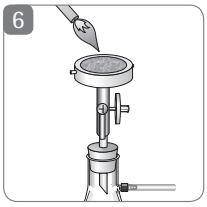
5

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.

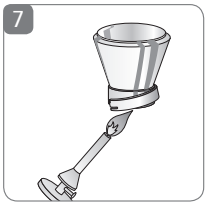
6



Open the vacuum valve.
(6 o'clock[1])
Carefully flame the filter support for ~10 sec.

Close the vacuum valve again.
(9 o'clock[2])

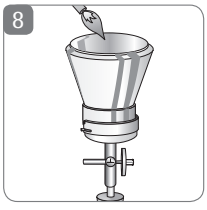
7



Take the funnel at both sides of the clamp and flame it from its lower side for ~10 sec.

Then place it on the filter support.

8

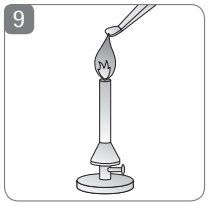


Open the vacuum valve again.
(6 o'clock[1])
Flame the inside of the funnel.

Close the valve again.
(9 o'clock[2])

To cool it off faster, rinse with a few ml of sterile water.

9

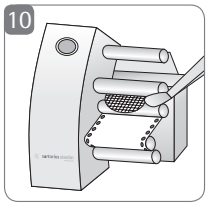


The forceps should always be stored in a small glass with alcohol.

Take it out of it and flame it.

Let it cool off for a few seconds before use.

10



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.

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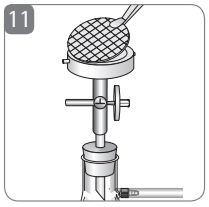
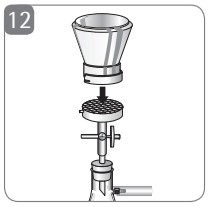


The membrane filter is placed by the tweezers onto the filter support of the filter holder.

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.

12



Place the funnel on the filter support and close it with the clamp.

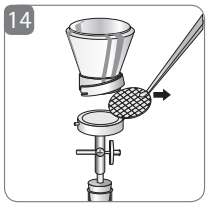
For long time filtration cover the funnel with the lid.

13

Open the valve and filter the sample.
(6 o'clock[1])
Rinse with a few mls of sterile water to remove all product residues or inhibitors that might be contained in the sample.

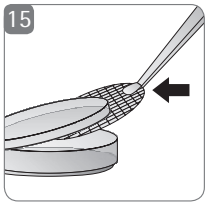
Close the valve again.
(9 o'clock[2]).

14



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

15



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.

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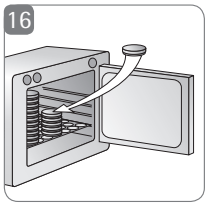


Place the Petri dish into the incubator, lid above.

Incubate strictly according to the recommendations.

Evaluate immediately after the end of the incubation time.

3 o'clock – After the Filtration Run
The residual vacuum between the pump and valve is released via the venting filter.

12 o'clock – For Autoclaving
For reliable sterilization, the steam flows freely through all openings.

1) **6 o'clock – For Filtration**
The tap is open. The full vacuum is effective at the filter support | membrane filter. The venting filter is "off-line".

2) **9 o'clock – After Filtration**
The tap is closed. The vacuum between the valve and membrane filter is released under sterile conditions. Secondary contamination of the bottom of the filter is ruled out entirely.

General Directions


Zertifikat

für mikrobiologische Trinkwasserringversuche

Das Niedersächsische Landesgesundheitsamt - Standort Aurich - bescheinigt hiermit, dass das Untersuchungslabor

Mikrobiologisches Labor

August-Spindler-Strasse 11

D-37079 Göttingen

unter der Code-Nummer 2600 am Ringversuch II / 2010 teilgenommen hat.

General Procedure
To obtain reliable results for microbiological tests, it is necessary to work under conditions that rule out contamination by microorganisms which distort such results.

That is why it is recommended to work near the flame of a Bunsen burner in a room protected from drafts. Before beginning with the actual procedure, spraying or washing down the working area with a disinfectant is mandatory (e.g., 70% alcohol).

Before use, filter holders, tweezers and scissors should be sterilized by one of the standard methods, such as flaming for routine tests.

How to Handle Microorganisms
Microorganism cultures must always be handled as carefully as if they contained pathogens.

Working with microorganisms is not dangerous if the following safety rules are observed:

Wash your hands thoroughly before and after working in a laboratory.

Do not eat or drink in a laboratory.

Do not touch bacterial matter with your hands.

Before and after use, inoculating loops and wires must be sterilized by flaming until they glow red-hot.

All laboratory equipment which has come in contact with bacteria must be sterilized.

To protect people and animals from contagious diseases or poisoning, living cultures have to be destroyed before cleansing or disposing of the containers. One method is to coat them thoroughly with disinfectants or to autoclave them in suitable containers.

Sartorius Stedim Biotech Nutrient Pads are participating regularly at official inter-laboratory tests for the microbiological investigation of drinking water according to the New European Drinking Water Guideline. This certificate of the "Niedersächsischen Landesgesundheitsamt" in Aurich (public health agency, Lower Saxony) quote a reference for the passed tests with good success.

Description 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.

References:
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.

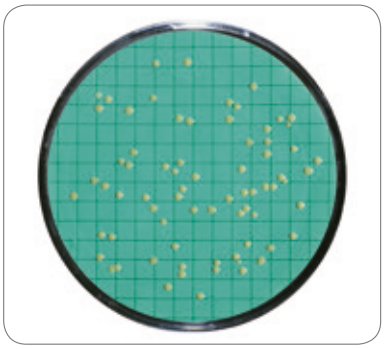
Standard TTC (I mod.) NPS
Type 14055

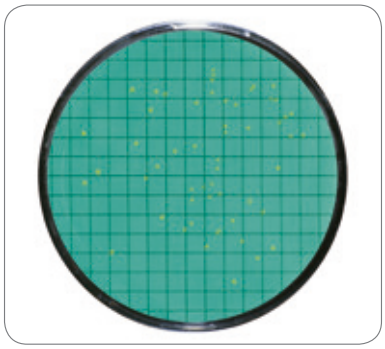
Meat extract-peptone medium for determining the total CfU count based on the "APHA (water)" and modified by the addition of TTC.
Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), waste water, beverages, beer, foods and other products.

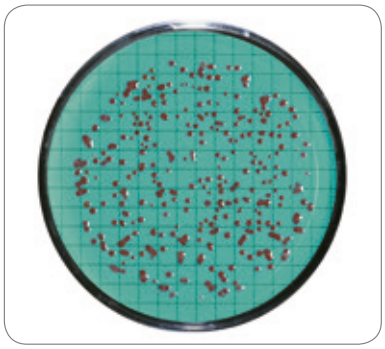
References:
APHA (water), ISO 7704, VLB

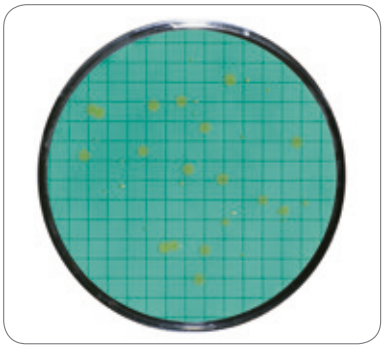
Incubation Conditions:
≤ 5 days at 30–35°C

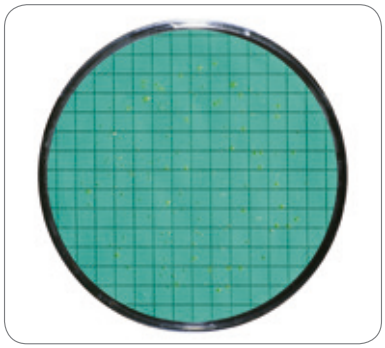
Evaluation and Typical Results:
Predominantly bacteria grow on this medium. The majority of their colonies are stained red by TTC reduction.

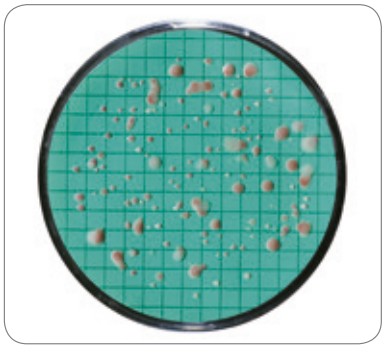

Staphylococcus aureus


Escherichia coli


Bacillus subtilis


Mixed culture from process water


Mixed culture from water


Mixed culture from well water

1. Total Colony Count

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
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.

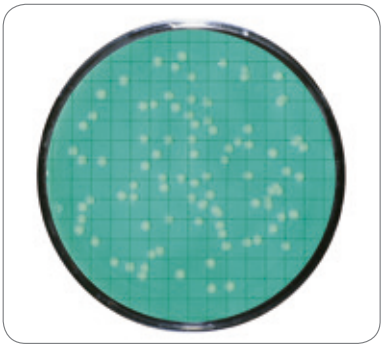
Yeast Extract NPS
Type 14090

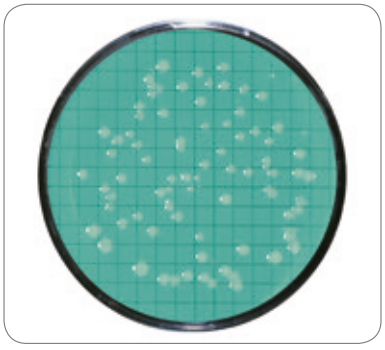
For the detection of the total count of aerobic heterotrophic bacteria. Dehydrated culture medium for cultivating microorganisms in water (general quality) and other products.

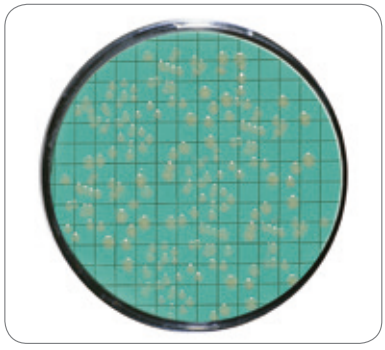
References:
EG 98/83, HMSO, ISO 6222, ISO 7704, ISO 8199

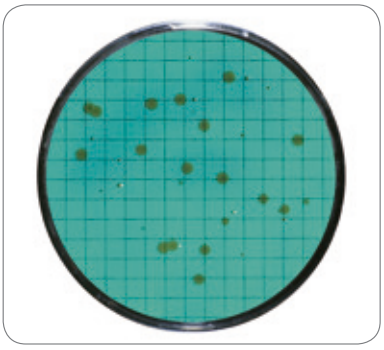
Incubation Conditions:
44 ±4 hours at 36 ±2°C;
68 ±4 hours at 22 ±2°C

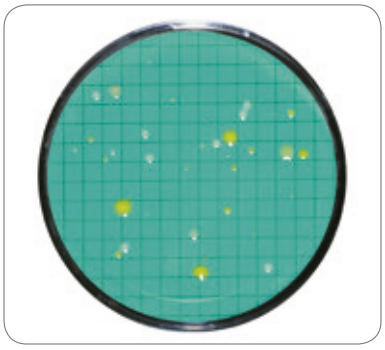
Evaluation and Typical Results:
Predominantly bacteria grow on this medium. The majority of all colonies are colorless.

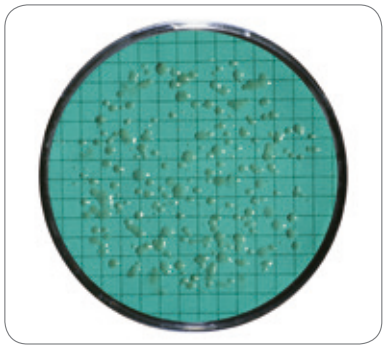

Escherichia coli


Escherichia coli


Escherichia coli


Mixed culture from drinking water


Mixed culture from water


Mixed culture from river water

2. E. Coli and Coliforms, Enterobacteria

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 ß-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.

* Trade mark owner and manufacturer is Merck KGaA

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 micro-organisms 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.

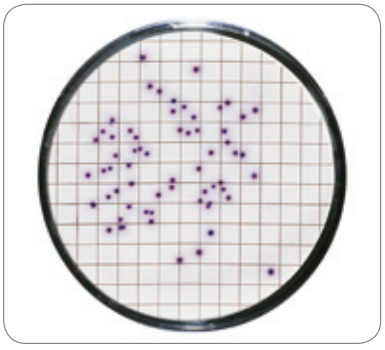
Endo NPS
Type 14053

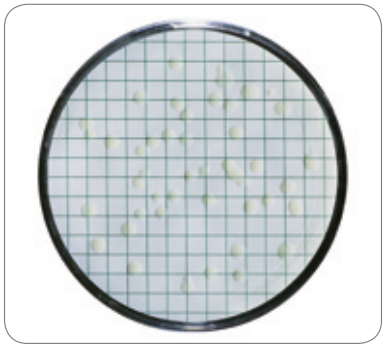
Selective medium for detecting and enumerating E. coli and coliform bacteria. Dehydrated culture medium for cultivating microorganisms in raw materials, water (general quality), natural water, waste water, beverages, soft drinks, concentrates, fruit juice, sugar, sugar products, foods and other products.

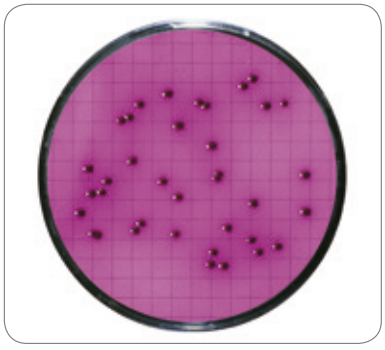
References:
APHA (dairy), APHA (food), APHA (water), DGHM, ISO 7704, ISO 9308-1 [1990], MNO, USDA

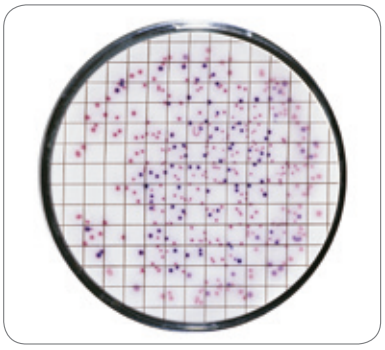
Incubation Conditions:
18–24 hours at 36 ±2 °C

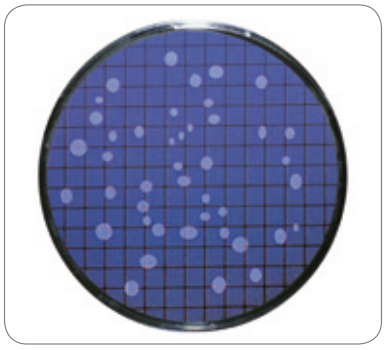
Evaluation and Typical Results:
E. coli form red colonies with a metallic sheen and a red dot at the underside of the membrane. Other coliforms grow as dark to light red colonies without metallic sheen. Colorless colonies of lactose-negative bacteria are not counted.

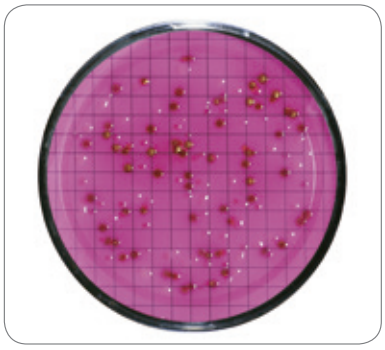

Escherichia coli


Escherichia coli


Escherichia coli


Mixed culture from water


E. coli colonies fluoresence in UV light


E. coli and coliforms from river water

2. E. Coli and Coliforms, Enterobacteria

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 non-faecal coliforms.

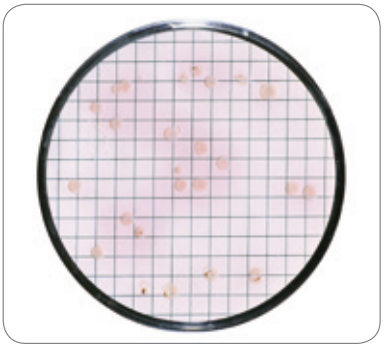
Teepol NPS
Type 14067

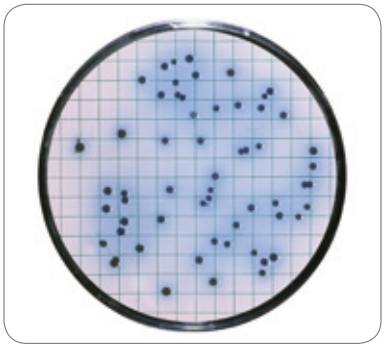
Lauryl Sulphate medium for the detection of E. coli and faecal coliform bacteria according to Burman, N.P. (1967). Dehydrated culture medium for cultivating microorganisms in water (general quality), waste water, beverages, foods and other products.

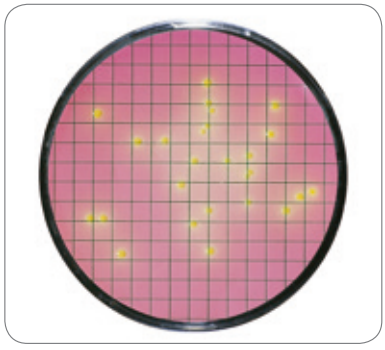
References:
AFNOR, APHA (water), BS, FDA, ISO 7704, ISO 9308-1 [1990], USDA

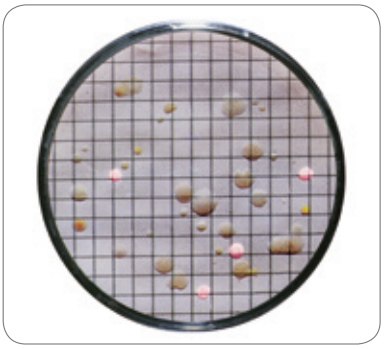
Incubation Conditions:
18–24 hours at 36 ±2°C

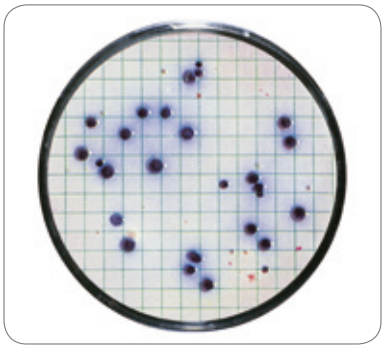
Evaluation and Typical Results:
E. coli and coliform bacteria form 1–2 mm diameter yellow colonies surrounded by a yellow zone. Non-lactose fermenting bacteria develop red or colorless colonies without yellow zone.

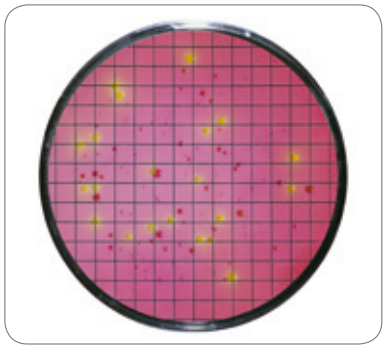

Escherichia coli


Escherichia coli


Escherichia coli


E. coli and coliforms from river water


E. coli and coliforms from waste water


E. coli and coliforms from waste water

3. Other Faecal Bacteria

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.

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.

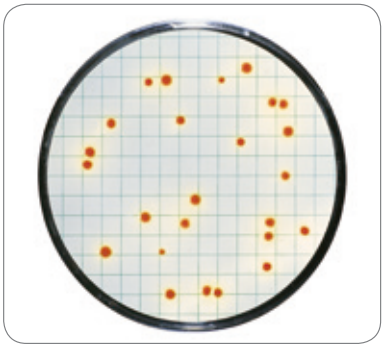
Bismuth Sulfite NPS
Type 14057

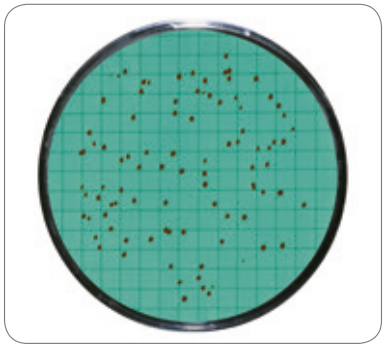
Selective culture medium according to Wilson and Blair for isolating Salmonella typhi and other salmonellae. Dehydrated culture medium for cultivating microorganisms in pharmaceuticals, cosmetics, raw materials, water (general quality), waste water, foods and other products.

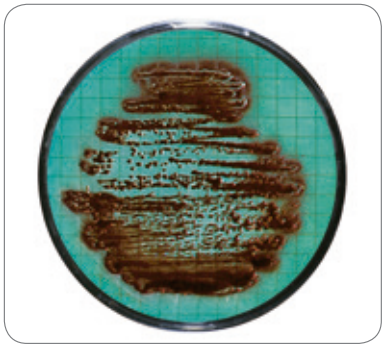
References:
AFNOR, APHA (dairy), APHA (food), AOAC, DGHM, FDA, HMSO, ISO 6579 [1981], ISO 7704, USDA, USP

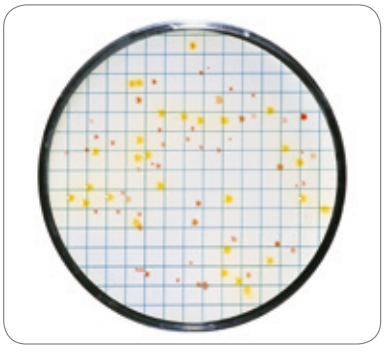
Incubation Conditions:
40–48 hours at 36 ±2°C

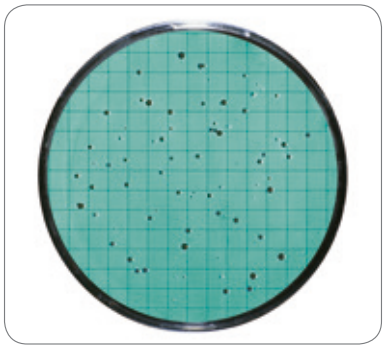
Evaluation and Typical Results:
Most salmonellae form light colored colonies with brown to black centers surrounded by a black zone with a metallic sheen ("fish eye"). Some Salmonella species develop uniformly dark brown to black colonies which may lack the typical zone. Remarks: If a very slight contamination 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.

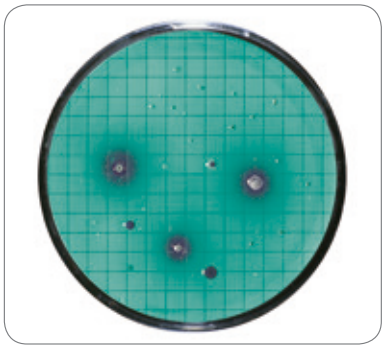

Escherichia coli


Enterococcus faecalis


Salmonella typhosa, streak


E. coli and coliforms from waste water


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.

5. Yeasts and Molds

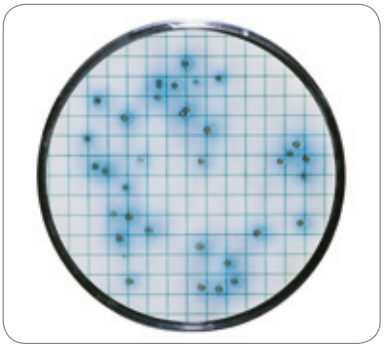
Lysine NPS
Type 14061

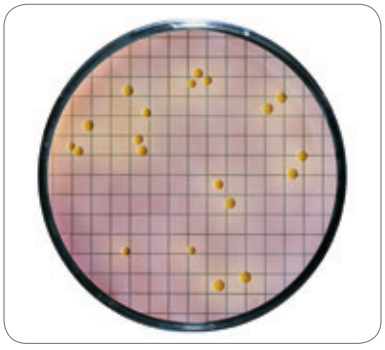
Selective medium for isolating and enumerating "wild yeasts" in breweries acc. to Morris and Eddy. Dehydrated culture medium for cultivating microorganisms in beer and other products.

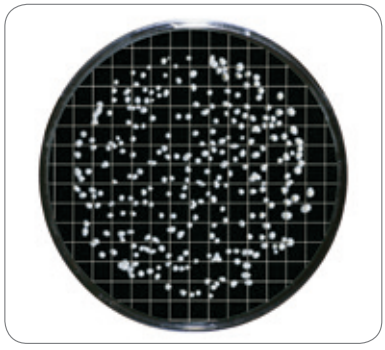
References:
Journal Institute of Brewing, VLB

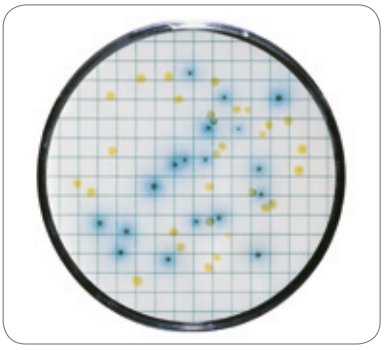
Incubation Conditions:
3–5 days at 30–35°C

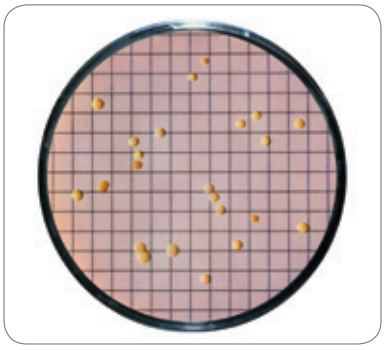
Evaluation and Typical Results:
Only "wild yeasts" (not belonging to the genus Saccharomyces) which utilize lysine as sole source of nitrogen grow on this medium, they form white or cream colored colonies; brewery culture yeasts grow not at all or very poorly.

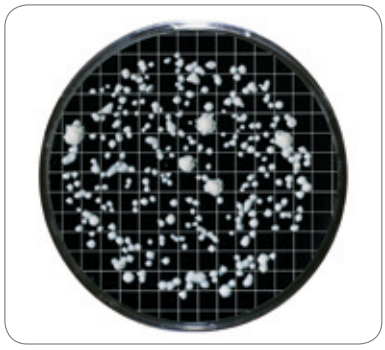

Pseudomonas aeruginosa


Staphylococcus aureus


Torulopsis spec.


Mixed culture with Pseudomonas aeruginosa


Mixed culture of staphylococci


"Wild yeasts" from lager beer

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

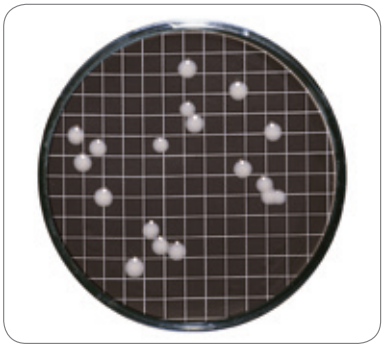
Evaluation and Typical Results:
Yeasts usually develop smooth white or colored colonies. Molds form velvety or fluffy, cotton-like colonies that are white in the early growth phase and may take various colors after conidiospore production. Remarks: According to the EP | USP antibiotics could be added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

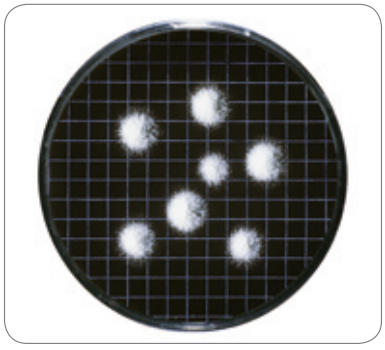
Schaufus Pottinger (m Green yeast and mold) NPS
Type 14070; 14072; 14080; 14083; 14091.

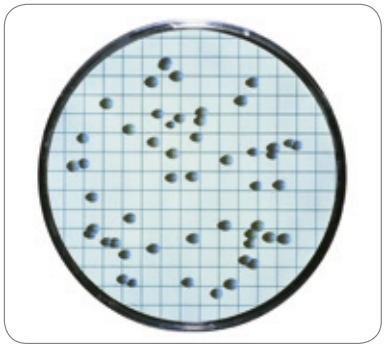
M Green Yeast and Mold medium for the detection of yeasts and molds according to Schaufus and Pottinger. Dehydrated culture medium for cultivating microorganisms in wine, soft drinks, concentrates, sugar, sugar products and other products.

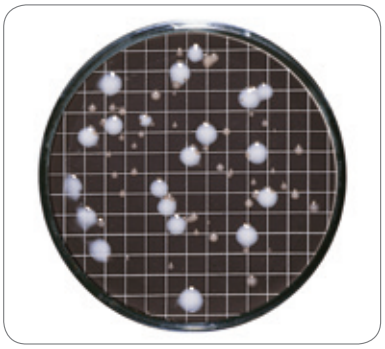
Incubation Conditions:
2–5 days at 20–25°C or at 30–35°C depending on the target of the investigation

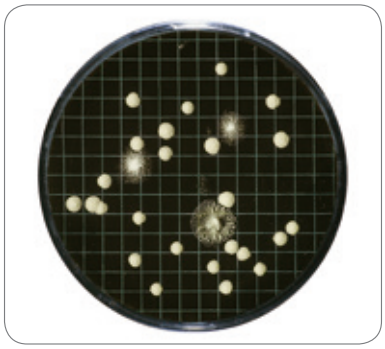
Evaluation and Typical Results:
Molds develop velvety or fluffy whitish or greenish colonies which can get various colors after conidiospore production. Yeasts have a smooth surface. Acid forming sugar fermenters are whitish to yellow, non-acid formers are, by contrast, greenish to blue-green. Remarks: 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.

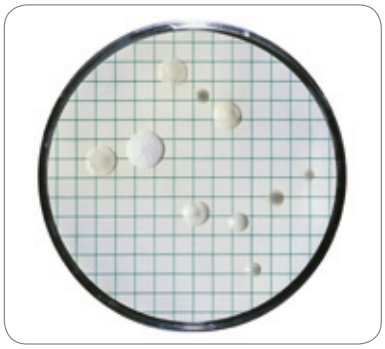

Saccaromyces cerevisiae


Alternaria humicola


Torula lipolytica


Mixed culture from Saccaromyces and Rhodutorula


Yeasts and molds from cough syrup


Mixed culture from a soft drink

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.

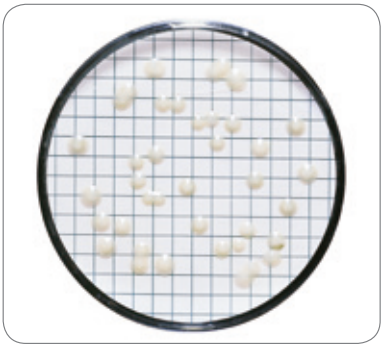
Glucose Tryptone NPS
Type 14066

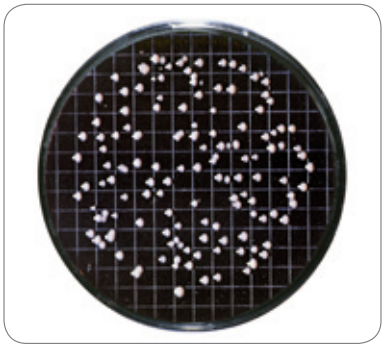
For the enumeration of mesophilic and thermophilic bacteria, especially "flat-sour" microorganisms in canned foods.

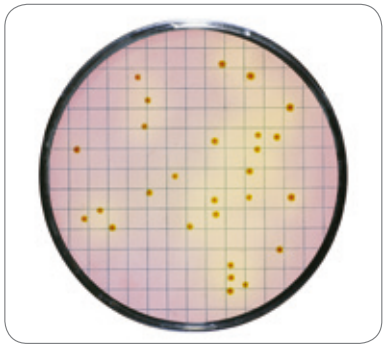
References:
APHA (dairy), APHA (food), AOAC, ICUMSA, IFU, ISO 7704, NCA

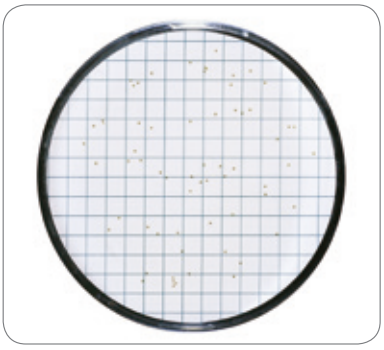
Incubation Conditions:
18–72 hours at 30–35°C for mesophilic bacteria; 48–72 hours at 55 ±2°C for thermophilic sporulating microorganisms

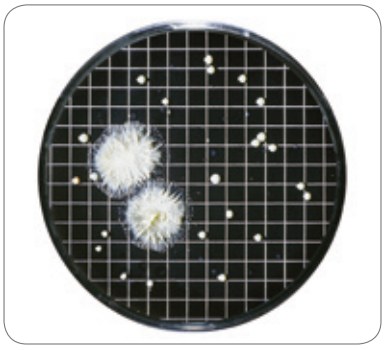
Evaluation and Typical Results:
Microorganisms that ferment glucose and produce acid grow as yellowish green colonies. "Flat-sour" colonies have a diameter of 2-5 mm, a yellowish-green color and are surrounded by a yellow zone. Remarks: For the incubation at 55 ±2°C the petri dishes must be placed into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

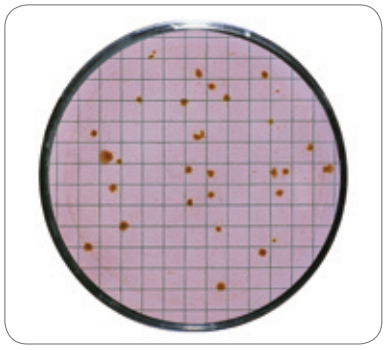

Saccharomyces cerevisiae


Saccharomyces cerevisiae


Bacillus coagulans, the "flat sour" colony


Lactobacillus plantarum


Yeasts and molds from spoiled beer


Mixed culture from canned vegetables

6. Product-spoiling Microorganisms

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 micro-organisms 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 micro-organisms 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.

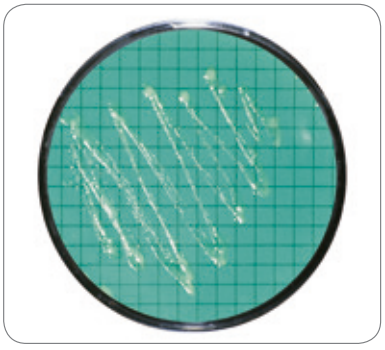
VLB-S7-S NPS
Type 14059

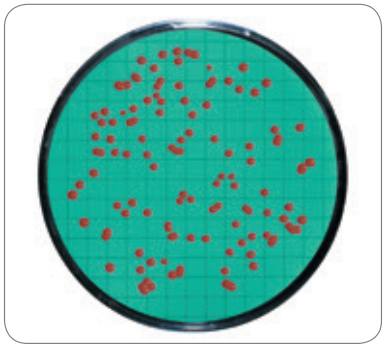
For the detection of pediococci and lactobacilli according to Emeis; modified acc. to Rinck and Wackerbauer. Dehydrated culture medium for cultivating micro-organisms in beer and other products.

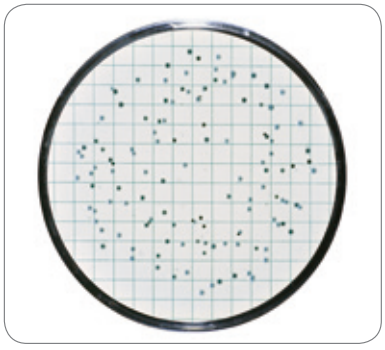
References:
EBC, ISO 7704, MEBAC, VLB

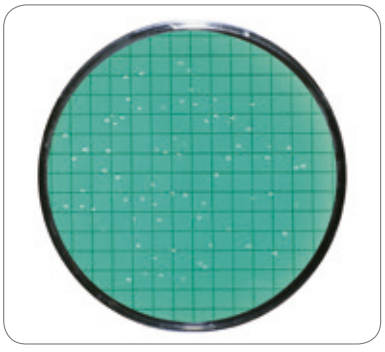
Incubation Conditions:
3–5 days at 30–35°C anaerobic (microaerophil)

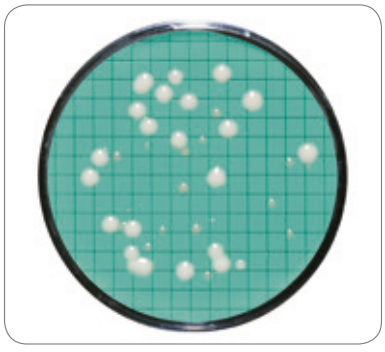
Evaluation and Typical Results:
Pediococci ("Sarcina") develop round pale green colonies with smooth peripheries and approx. 1 mm in diameter. Lactobacilli grow as slightly rounded, irregularly lobed colonies with approx. 2 mm in diameter which are initially light green and later dark green. Remarks: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

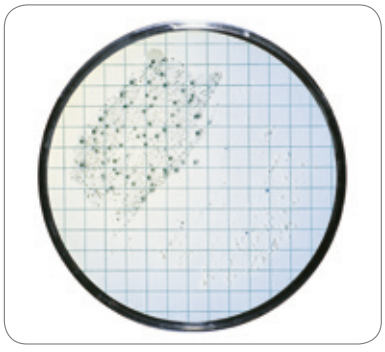

Lactic-acid bacteria, streak


Rhodotorula spec.


Lactobacillus brevis


Oenococcus oeni from wine


Mixed culture from a soft drink


Lactobacilli and pediococci from sediment, streak

6. Product-spoiling Microorganisms

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.

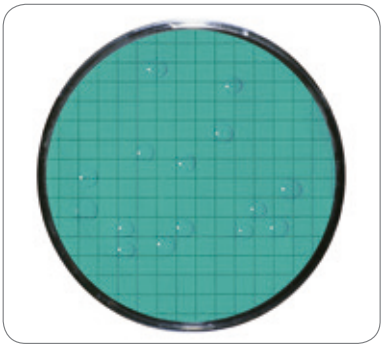
MRS NPS
Type 14077

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.

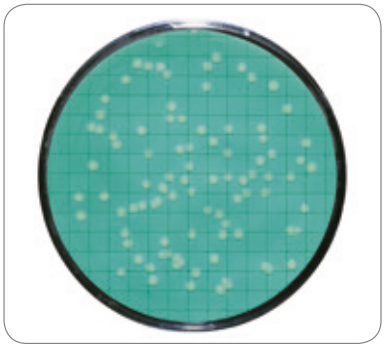
References:
APHA (food, dairy products)

Incubation Conditions:
3–5 days at 30°C anaerobic conditions

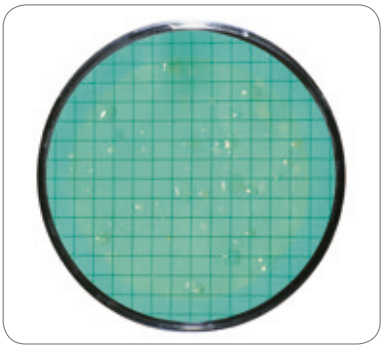
Evaluation and Typical Results:
The MRS NPS are used for the detection of a variety of Lactobacilli. The Lactobacilli species grow as slightly rounded whitish colonies with approximately 1–2 mm in diameter. Other microorganisms, which have not this typical growth, can be defined by confirmation tests.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



Leuconostoc mesenteroides



Lactobacillus brevis



Mixed culture from sugar syrup

Troubleshooting Guide

If the directions for use are not beeing 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.

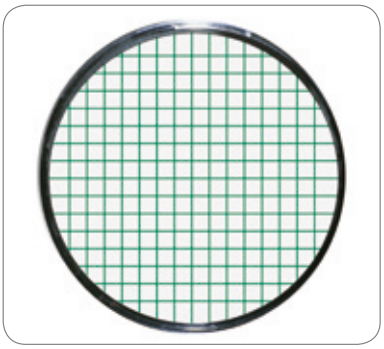
Membrane Filters for Use on Agar Plates or on Adsorbent Pads

If agar plates or absorbent pads to be wetted with liquid culture medium are used instead of Nutrient Pad Sets, we recommend Sartorius Stedim Biotech 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 Black Grid

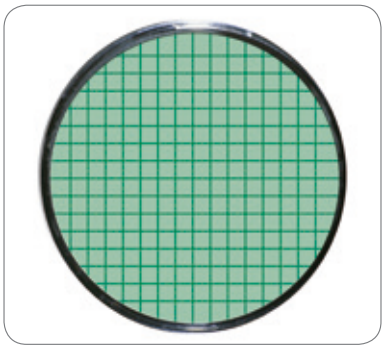
Pore Size	∅	Pckg. Size	Order No.
0.2 µm	47	100	11407-47-ACN*
	47	1,000	11407-47-ACR*
	50	100	11407-50-ACN*
	50	1,000	11407-50-ACR
0.45 µm	47	100	11406-47-ACN*
	47	1,000	11406-47-ACR*
	50	100	11406-50-ACN*
	50	1,000	11406-50-ACR*
HighFlow			
0.45 µm	47	100	**114H6-47-ACN**
	47	1,000	**114H6-47-ACR**
	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	∅	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*
HighFlow			
0.45 µm	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

Other types on request

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



Green Membrane with Dark Green Grid

Pore Size	∅	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*

HighFlow

The special pore structure of the 0.45 µm HighFlow 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 Stedim Biotech 0.45 µm membrane filter lot these membranes are also tested and released according to ISO 7704.

For Detection of Yeasts and Molds.

Grey Membrane with White Grid

Pore Size	∅	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
0.65 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)

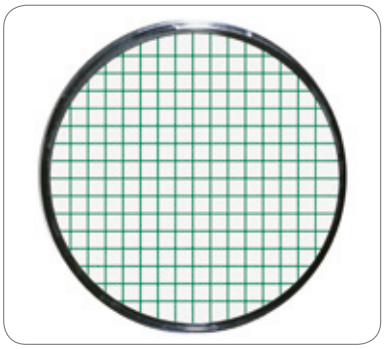
Prefilters, White Without Grid

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.

Membrane Filters for Use with Microsart® e.motion Dispenser

For Detection of Bacteria in Dyed Media.



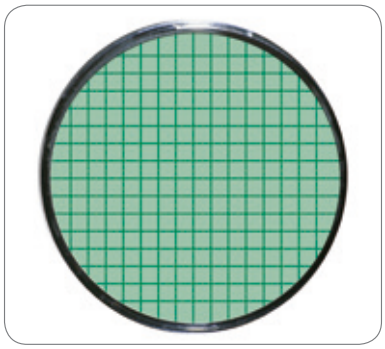
White Membrane with Black Grid

Pore Size	∅	Pckg. Size	Order No.
0.2 µm	47	3×100	11407Z-47----SCM
	50	3×100	11407Z-50----SCM
HighFlow			
0.45 µm	47	3×100	114H6Z-47----SCM
	50	3×100	114H6Z-47----SCM
0.45 µm	47	3×100	11406Z-47----SCM
	50	3×100	11406Z-47----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	∅	Pckg. Size	Order No.
0.45 µm	47	3×100	13906Z-47----SCM
	50	3×100	13906Z-50----SCM
HighFlow			
0.45 µm	47	3×100	114H6Z-47----SCM
	50	3×100	114H6Z-47----SCM

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



Green Filter with Dark Green Grid

Pore Size	∅	Pckg. Size	Order No.
0.2 µm	47	3×100	15407Z-47----SCM
0.45 µm	47	3×100	13806Z-47----SCM
	50	3×100	13806Z-50----SCM

For Detection of Yeasts and Molds.

Grey Filter with White Grid

Pore Size	∅	Pckg. Size	Order No.
HighFlow			
0.45 µm	47	3×100	130H6Z-47----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 HighFlow 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 Stedim Biotech 0.45 µm 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
	Total colony count	Standard, Standard TTC
	Wild yeasts	Lysine
	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	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	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

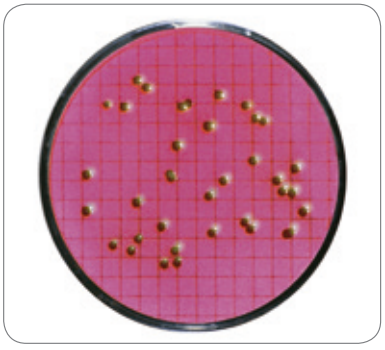
* These NPS types are suitable for the determination of the mentioned microorganisms, although the media are not explicit declared in the references described in this publication.

** 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 Stedim Biotech 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



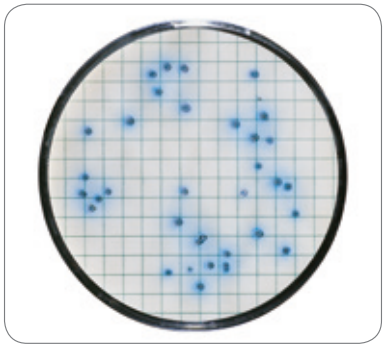
Sartorius Stedim Biotech cellulose nitrate membrane

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

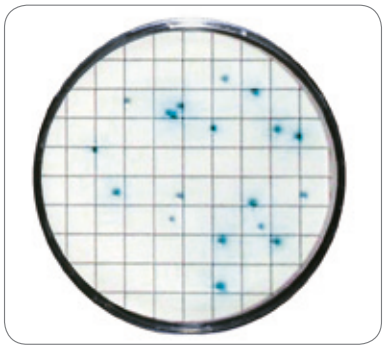
E. coli shows no metallic sheen on this mixed esters membrane. Therefore it is very difficult to differenciate between E. coli and coliforms without any further test. A quantitative statement is difficult due to the fact of running colonies on the mixed esters membrane surface.

Growth of Pseudomonas Aeruginosa on Cetrimide NPS



Sartorius Stedim Biotech cellulose nitrate membrane

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

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

Combi.jet 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.

16A07--10------N	Microsart Funnel 100, sterile in 5 sealed bags
16A07--25------N	Microsart funnel 250, sterile in 6 sealed bags
166MP-4	Microsart e.jet Transfer pump
16848-CJ	Microsart Combi.jet 2-fold manifold

Combisart® 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.

16407-25-ALK	Biosart 250 Funnels, 50 units, sterile-packaged
16407-25-ACK	Biosart 250 Funnels, 50 units, individually sterile-packaged

For further infomation about our Combisart manifolds and accessories, please consider our Combisart brochure.

Combisart® 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.

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
16414	Biosart 100 Adapter (altern. 16424)

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.

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

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

Vacuum Pumps, 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.

16694-2-50-22	Microsart® maxi.vac for multiple filtration runs, 230 V, 50 Hz
16694-1-60-22	Microsart® maxi.vac, 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, 115 V, 60 Hz
17804-M	Vacusart®, 3 individually sterile-packaged PTFE filter
166MP-4	Microsart® e.jet Transfer Pump
16610	Woulff's bottle, 500 ml, with stop cock
16623	Rubber vacuum hose, 1 m

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 (16840 or 16841) and a stainless steel funnel (as show at the photo) or Biosart 250 Funnel. Autoclavable and can be flamed.

16807	Prefilter attachment

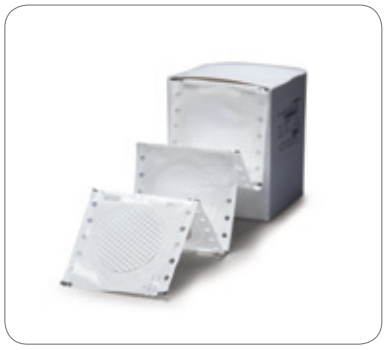
Dosing Syringe | Colony Counter
The most convenient way to moist the NPS with water is to use a dosing syringe with an adapted Minisart syringe filter. Simultaneous sterilization and dosing of demineralized water in 3.5 ml steps is easy done by dropping the sinker at the end of the suction tubing into the water, and the dosing syringe filled and dosed by operating the twigger automatically.

Compact battery operated colony counter, is as simple to use as a ball-point pen, and has a 4-digit LCD-display.

16685-2	Dosing syringe
17597k	Minisart®, 0.2 µm, individually sterile-packaged
17649	Colony Counter

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.

16712	Microsart® e.motion Dispenser



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
15407Z-47----SCM	green | dark green, 0.2 µm

Absorbent Pads
The 1.4 mm thick absorbent pads are wetted with the appropriate liquid culture medium before a membrane filter is placed on. Each box contains 1,000 absorbent pads in 10 tubes, each with 100 pads, and with manual dispensing device, all presterilized.

15410-47-ALR	Absorbent pads, 47 mm, each approx. 3 ml absorbent capacity
15410-50-ALR	Absorbent pads, 50 mm, each approx. 3.5 ml absorbent capacity
13906-47-APR	Absorbent pads, 47 mm, including membrane filters 0.45 µm, white | green grid, individually sterile-packaged

AirPort MD8
AirPort MD8 uses the gelatin membrane filter method guaranteeing reliable and exact measurement results. It is battery-powered and portable for universal use.

16757	AirPort MD8, 100-240 V, 47-63 Hz, complete with holder and battery charger
17528-80-ACD	Gelatin membranes, individually sterile-packaged, each in 1 bag
17528-80-BZD	Gelatin membranes, individually sterile-packaged, each in 3 bags

arium® Laboratory Water Systems
A choice of more than 70 arium® versions is available to meet all your requirements on water quality and to cover any application. Whether for standard applications, routine analysis or critical applications where reagent-grade water is required, the arium® series consistently supplies highest water quality for your application.

proDI	Standard applications, e.g. buffer preparation
proUV	Low TOC applications e.g. HPLC
proUF	Low endotoxin applications
proVF	Low TOC and low endotoxin applications

Further laboratory water systems on request.

Technical Data and Application Guide Nutrient Pad Sets

Detection Target and Reference[1)]	Test Sample Materials	Media Type (pH) Order No. (Filter Type)[2), 3)]	Recom. Incubtion Conditions[4)]
Counting of Total Colony Forming Units			
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
E. Coli and Coliforms, Enterobacteria			
E. coli and coliforms ISO 7704, Journal Food Protection, ZenHyg (journal of hygiene).	Raw materials, water (general quality), waste water, beverages, foods, other products.	**CHROMOCULT®*** (pH 7.0) 14087--47------N (7) 14087--47----RDN	20–28 h at 36 ±2°C
E. coli APHA (water), DIN 10110, EG 98/83, ISO 7704, ISO 8199, ISO 9308-1 [2001], LMBG, USDA.	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
E. coli and coliforms APHA (dairy), APHA (food), APHA (water), DGHM, ISO 7704, ISO 9308-1 [1990], MNO, USDA.	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
E. coli and coliforms APHA (food), APHA (water), AOAC, EPA, FDA, ISO 7704, ISO 9308-1 [1990], USDA.	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
Enterobacteria, E. coli APHA (dairy), APHA (food), APHA (water), AOAC, DAB, DIN 38411, DGHM, EP, ISO 7704, LMBG, MNO, USDA, USP.	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

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	09, 18, 26
24	03, 07, 09, 18, 26
24	06, 09, 11, 21, 25
24	06, 09, 19, 21, 22
24	06, 07, 09, 21, 25, 28
24	06, 07, 09, 11, 21
24	02, 06, 09, 21, 25, 26

[1)] Reference Guide on page 34.

[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 Stedim Biotech. 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 32.

* Trade mark owner and manufacturer is Merck KGaA

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 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			
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
Non-faecal, Pathogenic Bacteria			
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			
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
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	06, 07, 09, 11, 21
24	06, 07, 09, 11, 21
24	07, 08, 09, 22, 26
24	03, 09, 21, 25, 26
24	04, 09, 21, 22, 26, 30
24	07, 09, 21, 26, 27
24	05, 20, 23, 24
24	05, 20, 23, 24
24	01, 05, 20, 23, 24
24	03, 05, 20, 23, 24
24	05, 12, 19, 20, 23
24	05, 20, 23, 24

[1)] Reference Guide on page 34.

[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 Stedim Biotech. 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 32.

Detection Target and Reference [1]	Test Sample Materials	Media Type (pH) Order No. (Filter Type) [2, 3]	Recom. Incubtion Conditions [4]
Product-spoiling Microorganisms			
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 organ. 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 micro-organisms 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 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)
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)	3–5 d at 30–35°C

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

01. Aspergillus brasiliensis 16404, 1988
02. Bacillus cereus 11778, 345
03. Bacillus subtilis subsp. spizizenii 6633, 347
04. Brevundimonas diminuta 19146, 1635
05. Candida albicans 10231, 1386
06. Enterobacter aerogenes 13048, 30053
07. Enterococcus faecalis 29212, 2570
08. Enterococcus faecium 19434, 20477
09. Escherichia coli 8739, 1576
10. Geobacillus stearothermophilus 7953, 5934
11. Klebsiella pneumoniae 13883, 30104
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%)
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 acetotolerans 43578, 20749

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	13, 19, 22, 29, 31
24	14

[1)] Reference Guide on page 34.

[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:

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(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 Stedim Biotech. 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 32.

Remarks

The incubation conditions are recommended by Sartorius Stedim Biotech. 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 Stedim Biotech 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. For current specifications and lot release criteria please visit our homepage under: www.sartorius-stedim.com/NPSSearch.

Reference Guide

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

Abbreviation	Title
AFNOR	Association Franchaise 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 Schlamm-untersuchung (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 Bedarfs-gegenständegesetzes des BGA (testing procedures for food stuffs and articles of daily use)

Abbreviation	Title
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

Sales and Service Contacts

For further contacts, visit www.sartorius.com

Europe

Germany
Sartorius Stedim Biotech GmbH
August-Spindler-Strasse 11
37079 Goettingen

Phone +49.551.308.0
Fax +49.551.308.3289

Sartorius Stedim Systems GmbH
Robert-Bosch-Strasse 5 – 7
34302 Guxhagen

Phone +49.5665.407.0
Fax +49.5665.407.2200

France
Sartorius Stedim FMT S.A.S.
ZI Les Paluds
Avenue de Jouques – CS 91051
13781 Aubagne Cedex

Phone +33.442.845600
Fax +33.442.845619

Sartorius Stedim France SAS
ZI Les Paluds
Avenue de Jouques – CS 71058
13781 Aubagne Cedex

Phone +33.442.845600
Fax +33.442.846545

Austria
Sartorius Stedim Austria GmbH
Franzosengraben 12
1030 Vienna

Phone +43.1.7965763.18
Fax +43.1.796576344

Belgium
Sartorius Stedim Belgium N.V.
Leuvensesteenweg, 248/B
1800 Vilvoorde

Phone +32.2.756.06.80
Fax +32.2.756.06.81

Hungary
Sartorius Stedim Hungária Kft.
Kagyló u. 5
2092 Budakeszi

Phone +36.23.457.227
Fax +36.23.457.147

Italy
Sartorius Stedim Italy S.p.A.
Via dell'Antella, 76/A
50012 Antella-Bagno a Ripoli (FI)

Phone +39.055.63.40.41
Fax +39.055.63.40.526

Netherlands
Sartorius Netherlands B.V.

Phone +31.30.60.53.001
Fax +31.30.60.52.917

info.netherlands@sartorius.com

Poland
Sartorius Stedim Poland Sp. z o.o.
ul. Wrzesinska 70
62-025 Kostrzyn

Phone +48.61.647.38.40
Fax +48.61.879.25.04

Russian Federation
LLC "Sartorius ICR"
Uralskaya str. 4, Lit. B
199155, Saint-Petersburg

Phone +7.812.327.5.327
Fax +7.812.327.5.323

Spain
Sartorius Stedim Spain, S.A.U.
Avda. de la Industria, 32
Edificio PAYMA
28108 Alcobendas (Madrid)

Phone +34.902.110.935
Fax +34.91.358.96.23

Switzerland
Sartorius Stedim Switzerland AG
Ringstrasse 24 a
8317 Tagelswangen

Phone +41.52.354.36.36
Fax +41.52.354.36.46

U.K.
Sartorius Stedim UK Ltd.
Longmead Business Centre
Blenheim Road, Epsom
Surrey KT19 9 QQ

Phone +44.1372.737159
Fax +44.1372.726171

America

USA
Sartorius Stedim North America Inc.
5 Orville Drive, Suite 200
Bohemia, NY 11716

Toll-Free +1.800.368.7178
Fax +1.631.254.4253

Argentina
Sartorius Argentina S.A.
Int. A. Ávalos 4251
B1605ECS Munro
Buenos Aires

Phone +54.11.4721.0505
Fax +54.11.4762.2333

Brazil
Sartorius do Brasil Ltda
Avenida Senador Vergueiro 2962
São Bernardo do Campo
CEP 09600-000 - SP- Brasil

Phone +55.11.4362.8900
Fax + 55.11.4362.8901

Mexico
Sartorius de México S.A. de C.V.
Circuito Circunvalación Poniente
No. 149
Ciudad Satélite
53100, Estado de México
México

Phone +52.5555.62.1102
Fax +52.5555.62.2942

Asia | Pacific

Australia
Sartorius Stedim Australia Pty. Ltd.
Unit 5, 7-11 Rodeo Drive
Dandenong South Vic 3175

Phone +61.3.8762.1800
Fax +61.3.8762.1828

China
Sartorius Stedim Biotech (Beijing) Co. Ltd.
No. 33 Yu'an Road
Airport Industrial Park Zone B
Shunyi District, Beijing 101300

Phone +86.10.80426516
Fax +86.10.80426580

Sartorius Stedim Biotech (Beijing) Co. Ltd.
Shanghai Branch Office
3rd Floor, North Wing, Tower 1
No. 4560 Jin Ke Road
Pudong District, Shanghai 201210

Phone +86.21.68782300
Fax +86.21.68782332 | 68782882

Sartorius Stedim Biotech (Beijing) Co. Ltd.
Guangzhou Representative Office
Unit K, Building 23
Huihua Commerce & Trade Building
No. 80 Xianlie Middle Road
Guangzhou 510070

Phone +86.20.37618687 | 37618651
Fax +86.20.37619051

India
Sartorius Stedim India Pvt. Ltd.
#69/2-69/3, NH 48, Jakkasandra
Nelamangala Tq
562 123 Bangalore, India

Phone +91.80.4350.5250
Fax +91.80.4350.5253

Japan
Sartorius Stedim Japan K.K.
4th Fl., Daiwa Shinagawa North Bldg.
8-11, Kita-Shinagawa 1-chome
Shinagawa-ku, Tokyo, 140-0001 Japan

Phone +81.3.4331.4300
Fax +81.3.4331.4301

Malaysia
Sartorius Stedim Malaysia Sdn. Bhd.
Lot L3-E-3B, Enterprise 4
Technology Park Malaysia
Bukit Jalil
57000 Kuala Lumpur, Malaysia

Phone +60.3.8996.0622
Fax +60.3.8996.0755

Singapore
Sartorius Stedim Singapore Pte. Ltd.
1 Science Park Road,
The Capricorn, #05-08A,
Singapore Science Park II
Singapore 117528

Phone +65.6872.3966
Fax +65.6778.2494

South Korea
Sartorius Korea Biotech Co., Ltd.
8th Floor, Solid Space B/D,
PanGyoYeok-Ro 220, BunDang-Gu
SeongNam-Si, GyeongGi-Do, 463-400

Phone +82.31.622.5700
Fax +82.31.622.5799

www.sartorius.com

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