MERCK MILLIPORE

There is More to Pathogen Testing than Meets the Eye

Smart Solutions for More Convenience

Granulated and Ready-to-Use Culture Media |
Immunological Lateral Flow Tests

Merck Millipore is a business of MERCK

Developed by Experts
Designed for Daily Use

We think three-dimensional when devising our pathogen testing products: Flexibility, ease of use, and reliability are what we want you to experience in your daily routines. Spanning pre-enrichment, selective enrichment, sample preparation and detection, our solutions ensure accurate results in a minimum of time. Trust our certified products and regulatory expertise to give you peace of mind.

Benefit from Our Smart and Convenient Pathogen Testing Solutions to Optimize Your Processes:

Our convenient **Singlepath® and Duopath® Immunological Lateral Flow Tests** provide quick presence/absence answers in one easy step and deliver results within 24 to 48 hours, with no need for additional equipment expenditure.

In addition, we have used our long-standing expertise in regulatory compliant microbiology media to precisely match our Lateral Flow Kits with selective and non-selective **Granulated and Ready-to-Use Culture Media** for optimal results that require minimal hands-on time.

At Merck Millipore, we combine breakthrough products with a holistic approach to help you reach your food safety goals with speed and precision.

Quick, comprehensive and convenient: that's how we define new standards in food safety.

Contents

Products by Category

Products by Tested Organism

Dehydrated and Ready-to-Use Culture Media
The Basis for Success

Merck Millipore is a leader with almost 130 years of cumulative expertise in developing innovative culture media. Over the years, our portfolio has expanded to more than 300 dehydrated and 500 ready-to-use media, many of which are formulated specifically for food and beverage testing.

Safety, convenience and compliance with standards are the cornerstones of Merck Millipore's product philosophy. To guarantee their consistent high quality, all our media are strictly quality controlled according to stringent standards such as ISO 11133.

We carefully select only premium raw materials so you can achieve the high recovery and growth rates that you need for subsequent use of traditional or rapid testing methods. To ensure the highest safety standards almost all animal components of our media are sourced from TSE/BSE-free countries.

The culture media we provide are fully compatible with our rapid food testing solutions, ensuring fast as well as reliable results.

Granulated Culture Media: An Outstanding Dehydrated Format

Merck Millipore's Dehydrated Culture Media come in the form of outstanding granules. The excellent free-flowing properties, wettability and solubility of our granulated media make them much easier to use than traditional powdered media. They are also more homogenous, thereby minimizing the separation of components and clumping, even under warm or humid conditions. What's more, these media possess a longer shelf-life of up to five years. Merck Millipore's granulation process allows the inclusion of supplements in many of our dehydrated media. Your benefit: no extra work and no extra costs for buying the supplements separately.

Another important advantage of granulated media is that they significantly reduce the formation of dust, thereby minimizing the inhalation of media components that can lead to allergic reactions. Contamination of the lab environment is also vastly reduced.

For even greater convenience, Merck Millipore has now developed single-use, pre-weighed and gamma-irradiated Readybag® media pouches. For more information see page 6.

To see what a difference granulation makes watch our video:
www.merckmillipore.com/granulated-media-food

Safe	Minimizes airborne toxins and allergens, allergic responses and contamination of workplace
Accurate	Prevents component separation and clumping even under humid or warm conditions
Fast	Dissolves rapidly in water
Easy	Superior flow properties and non-sticking media ensure easier handling
Reliable	Homogenous distribution of ingredients assures high reproducibility even with small media quantities

Ready-to-Use Culture Media:
Maximum Convenience, Minimum Risk

Merck Millipore's Ready-to-Use Culture Media offer the utmost in convenience for your microbiological laboratory. They are available in tubes, bottles and as agar media in Petri dishes, ready for your immediate use. No preparation steps are required, saving you time, lab space and equipment – and therefore money.

Our Ready-to-Use Media already contain the supplements you need, including the ones that cannot be pre-added to dehydrated media because they are thermally unstable. This completely eliminates the risk that incorrect quantities of supplements are added mistakenly or at the wrong time of the cooling-down phase of agar media.

Time-Saving	No media preparation
Reproducible	No risk of human errors during media preparation
Convenient	All supplements included
Economical	Lower investment in equipment and maintenance

Be Smart – Take a Shortcut!
Readybag® Granulated Culture Media Pouches

Even meticulously planned microbiological testing workflows can be disrupted when the number of samples increases or staff are unavailable. Merck Millipore's Readybag® Granulated Culture Media Pouches speed up and simplify your food pathogen testing routines.

Readybag® pouches are pre-weighed and irradiated. This allows you to eliminate all media preparation steps from your workflow, reducing typical sample preparation time by more than 50 percent.

With single-use Readybag® pouches, there's:

- no weighing
- no autoclaving
- no supplement handling and
- no need for much lab space or equipment

Merck Millipore's expanding series of Readybag® pouches is available for different sample sizes and includes:

- *Salmonella* (Buffered Peptone Water for 25 g and 375 g food samples) and
- *Listeria* (Half Fraser Broth for 25 g and 125 g food samples)

A Workflow for Greater Lab Productivity

Fast, convenient and easy: Readybag® speeds up your workflow and reduces complexity, minimizing the likelihood of human error. Only a few simple steps are needed for testing:

Weigh your food sample in a stomacher bag

Open Readybag® and add pre-weighed contents

Add sterile water, easily dispensed from a water purification system like **Merck Millipore's Elix® Advantage***

Pre-dissolve gently and place into stomacher to homogenize sample in the enrichment broth

Ready to incubate!

Watch our video to find out how Readybag® can help you to streamline your workflow:
www.merckmillipore.com/readybag

*For more information on Merck Millipore Elix® Advantage visit
www.merckmillipore.com/elixadvantage

The Ultimate in Speed and Convenience
Singlepath® and Duopath® Lateral Flow Tests

Merck Millipore's Singlepath® and Duopath® Lateral Flow Tests are immunoassays for detecting pathogens with the ultimate convenience. Covering the major pathogens, the tests act as mini-laboratories in the "pregnancy test" format and always include a built-in control reaction. Another major advantage is that they deliver definite results as little as 20 minutes after sample enrichment.

Benefit from our many years of experience in producing granulated and ready-to-use enrichment media: We have formulated our broths to ideally complement our easy-to-use Lateral Flow Tests.

Fast	Definite results within 20 – 30 minutes
Easy-to-use	Simple sample application with clear yes/no results
Safe	Additional positive control and specially adapted enrichment media for precise, reliable results
Sustainable	No waste from additional plates for isolation and result confirmation
Accurate	Same outcome as classical detection method

What's Your Application?

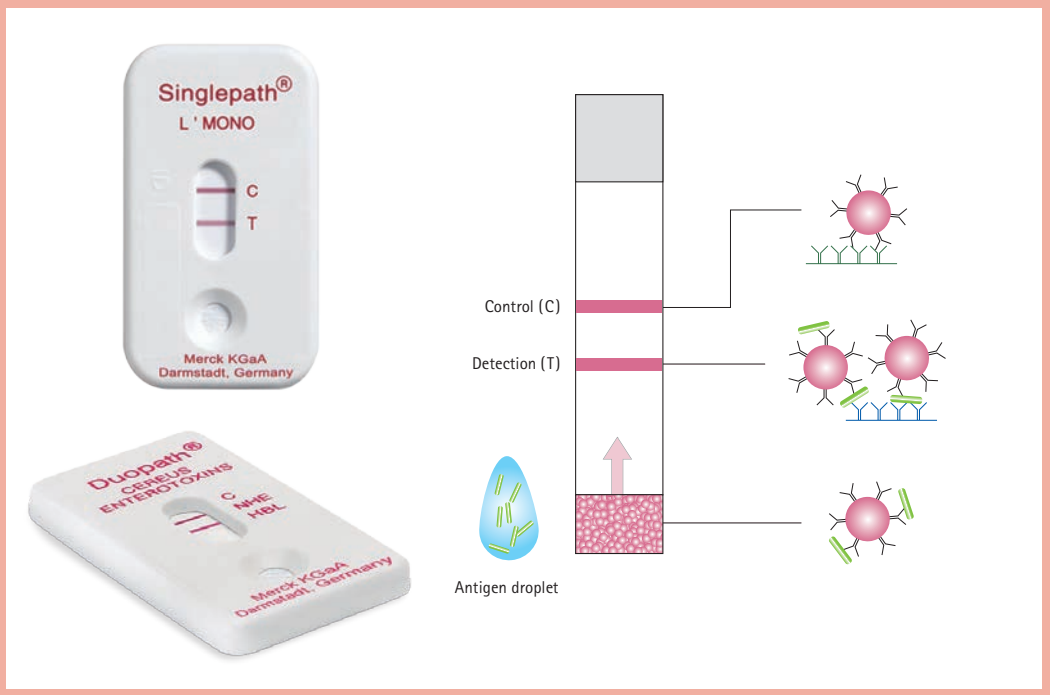
Merck Millipore's Singlepath® and Duopath® Lateral Flow Tests offer all the benefits of traditional testing methods with the addition of simplicity, speed, reliability and convenience. Use in combination with our Granulated Culture Media to ensure optimal test performance. Singlepath® E. coli O157, Singlepath® Salmonella, Singlepath® Campylobacter and Duopath® Verotoxins rapid tests are **AOAC-RI approved**.

When used as part of your monitoring program, they allow you to streamline a significant portion of your testing protocols, ensure the safety of your finished products and shorten your holding times.

Tests are available for:

Product	Ord. No.	Bacillus cereus	Campylobacter	Pathogenic E. coli	Listeria	Salmonella	Approval
Duopath® Cereus Enterotoxins	1.04146.0001	■					
Singlepath® Campylobacter	1.04143.0001		■				AOAC-RI
Singlepath® E. coli 0157	1.04141.0001			■			AOAC-RI
Duopath® STEC	1.04156.0001			■			AOAC-RI
Singlepath® L'mono	1.04148.0001				■		
Singlepath® Salmonella	1.04140.0001					■	AOAC-RI

Principle of Lateral Flow Tests



Singlepath® and Duopath® Rapid Test Kits are designed to screen for the presence of pathogenic and toxigenic bacteria in food matrices. The kits are based on immunochromatographic principles and use antibody-linked colloidal gold particles to react specifically with its complementary antigenic determinant to provide a visual reaction read-out.

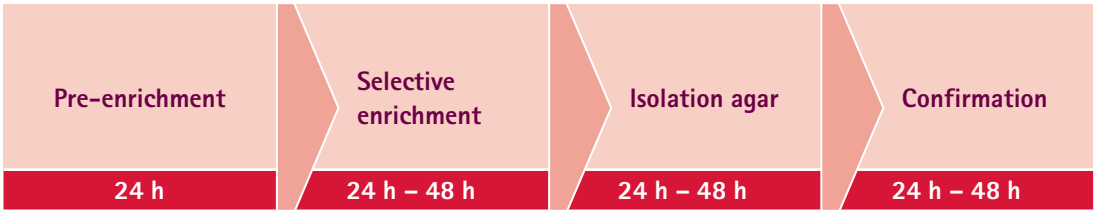
Accelerate Your Workflow

Merck Millipore's Singlepath® and Duopath® Lateral Flow Tests significantly shorten your pathogen testing workflows: isolation and confirmation steps are no longer required, resulting in time savings of 2 to 4 days and fewer plates going to waste.

So the bottom line is: you save time and costs while your lab becomes more environmentally friendly. The only plating steps required are – like in the traditional testing workflow – primary pre-enrichment and, in some cases, selective enrichment.

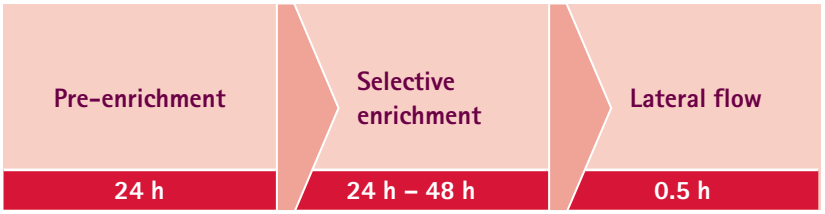
The following illustration compares the traditional testing workflow with the workflow when using Merck Millipore's Singlepath® for Listeria and Salmonella detection.

Traditional testing workflow:



Total time to result:
4 – 7 days

Merck Millipore's Singlepath® and Duopath® Lateral Flow Tests



Total time to result:
2 – 3 days

Product Solutions

In the following section, you will find detailed information about a range of food and water pathogens. Each pathogen is briefly described, the main reference methods are summarized, and the Merck Millipore product selection for the detection of each individual pathogen is listed.

Please note that only the standard pack sizes are listed in the tables. Other pack sizes may be available on request.

The availability of our ready-to-use media is country-dependent. For further information please check with your local sales representative.

Bacillus cereus

Bacillus cereus is an environmentally widespread gram-positive, spore-forming, motile rod, which can cause gastrointestinal (e.g. diarrhea) as well as non-gastrointestinal diseases (e.g. septicemia, endocarditis, infections of the central nervous system) in humans. The illness is normally self-limiting and of short duration, although a few fatal cases have occurred. Reporting of *Bacillus cereus* food poisoning is not required, and thus the relatively low number of registered cases is regarded as representing only about 1 % of the actual cases. The frequency of cases also varies geographically, accounting for less than 1 % of all food-related illnesses in some countries while more than 30 % in others.

Bacillus cereus is isolated from foods relatively frequently, making it an important environmental indicator organism for the food industry. Foods bearing contamination risk include meat and dairy products, vegetables, soups, spices and especially baby food.

Almost all *Bacillus cereus* strains possess the ability to produce one or more toxins. Cytotoxic enterotoxins are produced by almost 95 % of isolates. Of these, non-hemolytic enterotoxin (NHE) is produced by more than 90 % and hemolysin BL (HBL) by about 55 % of all *Bacillus cereus* isolates. The assumption is that HBL and NHE are formed in the gut after the consumption of foods contaminated by vegetative cells or spores of *Bacillus cereus*.

Ordering Information

		Granulated	Ready-to-use			Reference method			Alternative rapid method	
Procedure Step	Product Description			Pack Size	Ord. No.	ISO 21871	BAM Ch. 14	MLG 12	Approval	
Enrichment	TSB	■		500 g	1.05459.0500	■	■			
	Bacillus cereus Selective Supplement			10 vials	1.09875.0010	■	■			
	CGY Broth Base	■		100 g	1.01868.0100				■	
	D-(+)-Glucose Monohydrate	■		1 kg	1.08342.1000				■	
Detection	Duopath® cereus Enterotoxins			25 tests	1.04146.0001				■	
Isolation/ confirmation	MYP Agar Base	■		500 g	1.05267.0500	■	■	■		
	MYP Agar		■	20 plates	1.46160.0020	■	■	■		
	Bacillus cereus Selective Supplement			10 vials	1.09875.0010	■	■	■		
	Bacillus cereus Agar PEMBA		■	20 plates	1.46711.0020	■				
	Cereus IDENT Agar		■	20 plates	1.46092.0020					
	Egg Yolk Emulsion (sterile)			100 ml	1.03784.0001	■	■	■		

Reference methods

Procedure step	ISO 21871	FDA BAM Chapter 14	FSIS MLG 12
Enrichment	TSPB, 30 ± 1°C; 48 ± 4 h	TSPB, 30 ± 1°C; 48 ± 4 h	N/A
Isolation	PEMB Agar, 37°C; 18 – 24 h (48 h), MYP Agar, 30°C; 18 – 24 h (48 h)	MYP Agar, 30°C; 18 – 24 h (48 h)	MYP Agar, 30°C; 20 – 24 h

Campylobacter

Campylobacter spp. are currently regarded as the leading cause of bacterial gastroenteritis in humans worldwide. There is an increasing demand for *Campylobacter* testing in food to meet new regulations regarding *Campylobacter* levels in poultry. The majority of *Campylobacter* spp. are relatively metabolically inactive, making identification based on biochemical characteristics difficult. Currently, the most commonly used techniques to test food products for *Campylobacter* are traditional methods based on culture media. The standard detection method involves enrichment for 48 hours, followed by isolation on selective agars, so that final identification results are available only after 4 – 5 days. Both culture steps have to be carried out in a microaerophilic environment. These methods are time-consuming as well as labor-intensive.

Campylobacteriosis

Campylobacteriosis is an infection caused by *Campylobacter*, most commonly *C. jejuni*. It produces an inflammatory, sometimes bloody, diarrhea or dysentery, including cramps, fever and abdominal pain. The debilitating neurological disorder, Guillain-Barre Syndrome (GBS), as well as reactive arthritis have also been associated with recent infections with certain *C. jejuni* strains. *C. lari* and the emerging pathogen, *C. upsaliensis*, have also been reported in a small percentage of cases of human *Campylobacter* infection.

Campylobacter spp. are highly infectious: as few as 500 bacteria can cause illness. *Campylobacter* infections are usually caused by consuming cross-contaminated or insufficiently processed food (typically red meat, poultry, shellfish and unpasteurized milk). Less common are infections as a consequence of eating contaminated fruit and vegetables. In addition, water contaminated with animal and avian feces, agricultural run-off and sewage effluent can act as sources for infection with *Campylobacter* bacteria.

Ordering information

		Granulated	Ready-to-use			Reference method			Alternative rapid method	
Procedure Step	Product Description			Pack Size	Ord. No.	ISO 10272-1	BAM Ch. 7	MLG 41.00	Approval	
Enrichment	Bolton Broth Selective Supplement			10 vials	1.00079.0010	■	■	■	■	
	BPW	■		500 g	1.07228.0500	■	■	■	■	
Detection	Singlepath® Campylobacter			25 tests	1.04143.0001				■	AOAC-RI
Isolation/ confirmation	CCDA Selective Supplement			10 vials	1.00071.0010	■	■			
	Columbia Blood Agar Base	■		500 g	1.10455.0500	■	■			

Reference method

Procedure step	ISO 10272-1	FDA BAM Chapter 7	FSIS MLG 41.00
Pre-enrichment	Bolton Broth, 37 ± 1°C; 4 – 6 h, microaerophilic	Bolton Broth, 37 ± 1°C; 4 h, microaerophilic or 30°C, 3 h + 37°C, 2 h microaerophilic	N/A
Selective enrichment	Bolton Broth 41.5°C, 44 ± 4 h microaerophilic	Bolton Broth 42°C, 20 and 44 ± 4 h, microaerophilic	BPW + 2 x Blood-Free Bolton Broth, 42 ± 1°C; 48 ± 2 h, microaerophilic
Isolation	mCCD agar + additional, 41.5°C; 44 ± 4 h, microaerophilic	mCCD agar or AHB Agar, 37 – 42°C; 24 – 48 h, microaerophilic	Campy-Cefex Agar, 42 ± 1°C; 48 ± 2 h, microaerophilic

Clostridium perfringens

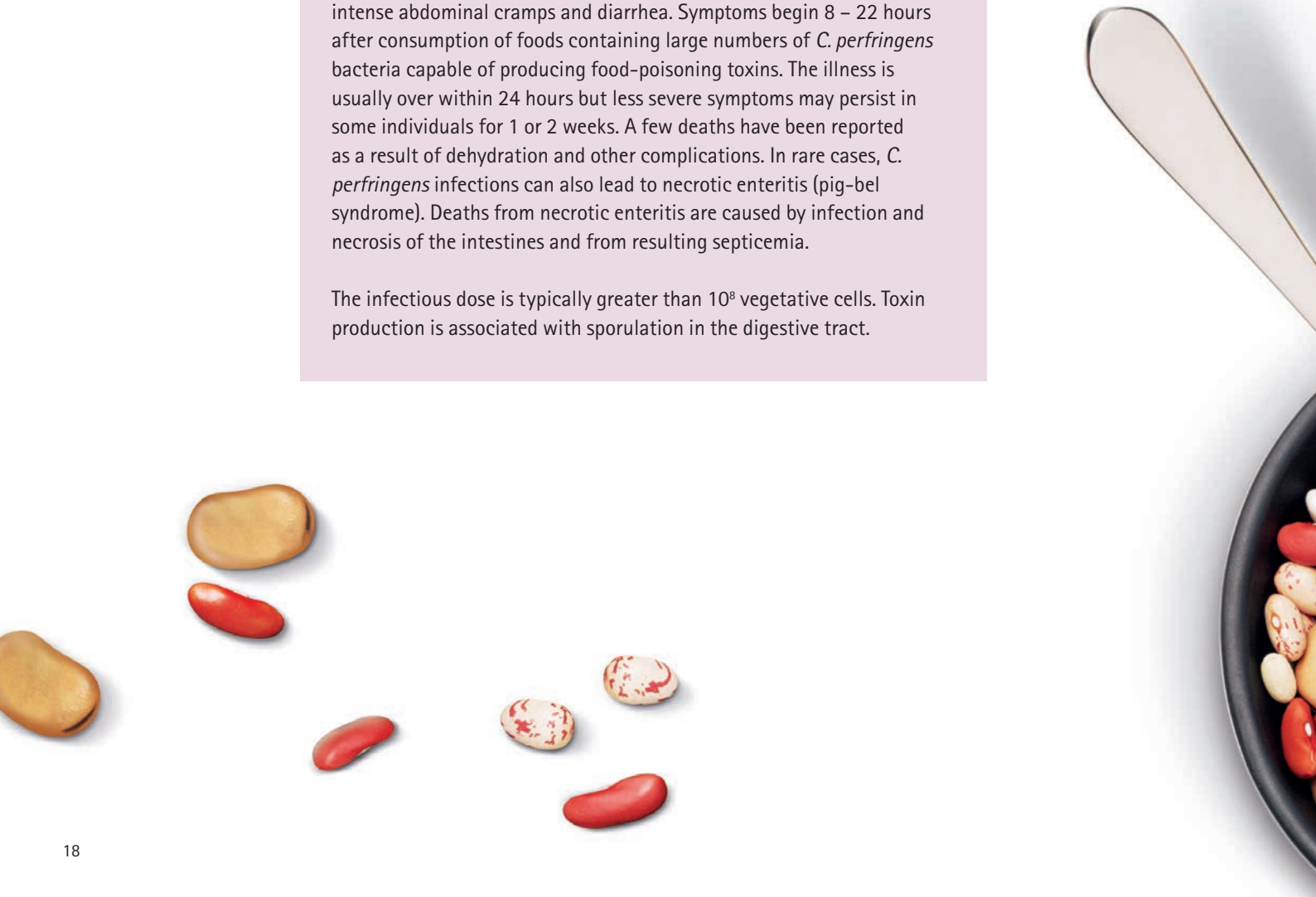
Clostridium perfringens is an anaerobic, gram-positive, spore-forming rod. It is widely distributed in the environment and frequently occurs in the intestines of humans and many domestic and feral animals. Spores of the organism persist in soil, sediments, and areas subject to human or animal fecal pollution.

The spores are heat-resistant and are not killed by ordinary cooking. Some strains can survive 100°C (212°F) for up to 1 hour. Most cases of poisoning by *C. perfringens* are associated with temperature abuse of prepared foods. Small numbers of the organisms are often present after cooking and multiply to food-poisoning levels during the cooling down and storage of prepared foods. Typically this bacterium will grow in foods that are high in starch or protein, such as cooked beans, meat products, thick soups, and gravy.

Clostridium perfringens infection

The common form of *C. perfringens* poisoning is characterized by intense abdominal cramps and diarrhea. Symptoms begin 8 – 22 hours after consumption of foods containing large numbers of *C. perfringens* bacteria capable of producing food-poisoning toxins. The illness is usually over within 24 hours but less severe symptoms may persist in some individuals for 1 or 2 weeks. A few deaths have been reported as a result of dehydration and other complications. In rare cases, *C. perfringens* infections can also lead to necrotic enteritis (pig-bel syndrome). Deaths from necrotic enteritis are caused by infection and necrosis of the intestines and from resulting septicemia.

The infectious dose is typically greater than 10^8 vegetative cells. Toxin production is associated with sporulation in the digestive tract.



Ordering Information

		Granulated	Ready-to-use			Reference method			Alternative rapid method	
Procedure Step	Product Description			Pack Size	Ord. No.	ISO 7937	BAM Ch. 16	MLG 13.0	Approval	
Enrichment	Thioglycollate Broth (anaerobic)	■		500 g	1.08190.0500			■		
Sample dilution	Maximum Recovery Diluent	■		500 g	1.12535.0500	■				
Isolation/ confirmation	TSC Agar base	■		500 g	1.11972.0500	■	■	■		
	Clostridium perfringens Selective Supplement			10 vials	1.00888.0010	■	■	■		
	Egg Yolk Emulsion			10 x 100 ml	1.03784.0001	■	■	■		
	Tryptose-Sulfite-Cycloserine (TSC) Agar		■	20 plates	1.46165.0020	■	■	■		
	Fluid Thioglycollate Medium		■	20 tubes	1.46139.0020	■	■	■		

Reference method

Procedure step	ISO 7937	FDA BAM Chapter 16	FSIS MLG 13.00/FDA BAM Chapter 16
Isolation	Sulfite-Cycloserine Agar (TSC w/o egg yolk), 37°C; 20 ± 2 h, anaerobic	Sulfite-Cycloserine Agar (TSC w/o egg yolk), 35°C; 20 ± 2 h, anaerobic	TSC Agar w/ egg yolk, overlay w/o egg yolk, 35°C; 24 h, anaerobic
Confirmation	Fluid Thioglycollate medium, 37°C / 35°C, 21 ± 3 h, anaerobic Lactose Sulfite medium, 46°C, 21 ± 3 h / Nitrate Motility medium, 37°C, 24 h, anaerobic	Fluid Thioglycollate medium, 35°C, 21 ± 3 h Nitrate Motility medium, 35°C, 24 h, anaerobic	Fluid Thioglycollate medium, 35°C, 21 ± 3 h Nitrate Motility medium, 35°C, 24 h, anaerobic

Escherichia coli O157 / EHEC / STEC / VTEC

E. coli are Gram-negative, non-sporulating, facultative anaerobic bacilli. They can grow on a wide range of substrates and at temperatures ranging from below 15°C up to 45°C or even higher, as seen with certain laboratory strains (optimum temperature 37°C). Some strains are motile and possess flagella.

Amongst the pathogenic *E. coli*, verotoxin-forming strains (STEC or VTEC) have gained importance in recent years. The group of enterohemorrhagic *E. coli* (EHEC) with its highly pathogenic serovar O157:H7 strain is particularly interesting in this respect. The main sources of infection are contaminated, raw or insufficiently heated foods of animal origin, such as meat and dairy products. The reservoir for EHEC is the gut of ruminants. The microorganisms can enter food during the processing of meat and dairy products if hygienic conditions are inadequate. The drastic increase in the incidence of food contamination caused by *E. coli* O157 demands reliable and rapid methods of detection. Consequently, both molecular and immunological techniques are becoming increasingly popular with users due to their superior specificity and sensitivity.

EHEC infection

EHEC is capable of inducing life-threatening illnesses, particularly in people with immune deficiency, young children and the elderly. Although the most common cause of EHEC is *E. coli* O157, other serotypes, such as O26, O45, O103, O111, O121, and O145, are also relatively frequent causes of infection.

Typical symptoms are severe abdominal pain and diarrhea, which is initially watery but often becomes bloody. These are occasionally accompanied by vomiting. The illness is usually self-limited and lasts for an average of 8 days. In up to 10 % of all cases, kidney complications (so-called hemolytic-uremic syndrome or HUS) occur, which can lead to temporary or even permanent kidney damage. Neurological symptoms may also occur.

Ordering Information

		Granulated	Ready-to-use			Reference method			Alternative rapid method	
Procedure Step	Product Description			Pack Size	Ord. No.	ISO 16654	BAM Ch. 4a	MLG 5.05	Approval	
Enrichment	mTSB + Novobiocin	■		500 g	1.09205.0500	■		■	■	AOAC-RI
	BPW (basis for mBPWp)	■		500 g	1.07228.0500		■			
Detection	Singlepath® E. coli O157			25 tests	1.04141.0001				■	AOAC-RI
Detection/ confirmation	CAYE Broth Base	■		100 g	1.00060.0100				■	AOAC-RI
	CAYE Broth Supplement			10 vials	1.00051.0010				■	AOAC-RI
	Duopath® STEC			25 tests	1.04156.0001				■	AOAC-RI
	Bacillus cereus Selective Supplement			10 vials	1.09875.0010				■	AOAC-RI
Isolation/ confirmation	Sorbitol MacConkey Agar (SMAC Agar)	■		500 g	1.09207.0500	■	■			
	CT-Supplement			10 vials	1.09202.0010	■	■			

Reference method

Procedure step	ISO 16654	FDA BAM Chapter 4A	FSIS MLG 5.05
Pre-enrichment	mTSB+N, 41.5 ± 1°C; 6 and 18 – 24 h	mBPWp, 37 ± 1°C; 5 h	mTSB+N, 42°C; 15 – 22 h
Selective enrichment	Immunomagnetic Concentration	Add ACV supplement, 42 ± 1°C; 18 – 24 h Optional Immunomagnetic separation	Immunomagnetic separation
Isolation	CT-SMAC agar, 37°C; 18 – 24 h	CT-SMAC Agar + chromogenic agar (Rainbow O157 Agar or R&F *E. coli* O157 Agar), 37 ± 1°C; 18 – 24 h	Rainbow O157 Agar, 35 ± 2°C; 24 – 26 h

Enterobacteriaceae and Enterobacter sakazakii (Cronobacter spp.)

Enterobacteriaceae comprise a large number of gram-negative, rod-shaped bacteria typically found in the intestines of virtually all animals.

A number of common pathogens belong to this family, such as *Salmonella, E. coli* O157, *Shigella, Yersinia* and *Cronobacter*. This group of bacteria also includes environmental species, which often appear in the food manufacturing environment. *Enterobacteriaceae* can be used for routine screening as their presence indicates possible contamination with pathogens. If they are found to be present, testing for specific pathogens can be initiated.

According to EU Commission Regulation (EC) 2073/2005, *Salmonella* and *Enterobacter sakazakii* must be absent in infant formulas, formulas for special medical purposes and follow-on formulas. The presence of these pathogens constitutes a considerable risk when conditions allow growth of the bacteria.

Enterobacter sakazakii (Cronobacter spp.) infection

Enterobacter sakazakii (*Cronobacter* spp.) is a pathogenic bacterium within the *Enterobacteriaceae* family which has been re-classified as 6 species within the genus Cronobacter. Although the majority of infection cases are reported in adults, these are rarely of a serious nature. However, in infants (less than 2 months old), it can cause bacteremia, meningitis and necrotizing enterocolitis, primarily in low birth weight neonates who are immunocompromised. *E. sakazakii* infection has been associated with the use of powdered infant formula, with some strains capable of surviving in a desiccated state for more than 2 years.

Ordering Information

		Granulated	Ready-to-use			Reference method			Alternative rapid method	
Procedure Step	Product Description			Pack Size	Ord. No.	ISO TS 22964	BAM Ch. 29	MLG		Approval
Enrichment	BPW	■		500 g	1.07228.0500	■				
Selective/ secondary enrichment	LST Broth	■		500 g	1.10266.0500	■				
	Sodium Chloride			1 kg	1.06400.1000	■				
	Vancomycin (Calbiochem)	■		250 mg	627850	■				
	EE-Broth	■		500 g	1.05394.0500		■			
Isolation/ confirmation	Chromocult® Entero-bacter sakazakii Agar	■		500 g	1.00873.0500	■				
	VRBD Agar	■		500 g	1.10275.0500					
	VRBD Agar		■	20 plates	1.46000.0020					

Reference method

Procedure step	ISO 22964	FDA method for infant formulae
Pre-enrichment	BPW, 37°C, 18 ± 2 h	Sterile distilled water pre-warmed to 45°C; 16 – 20 h at 36°C
Selective enrichment	mLST-Vancomycin medium, 44°C, 24 ± 2 h	EE Broth. 16 – 24 h at 36°C
Isolation	*Enterobacter sakazakii* Isolation agar, 44 ± 1°C, 24 h	VRBD. 16 – 24 h at 36°C

Legionella

Legionella are pathogenic gram-negative bacteriae, ubiquitously distributed in both natural and artificial water environments. They are acid-tolerant (pH 2.8 – pH 8.3) as well as thermo-tolerant (<20°C – 66°C), and thus they can adapt to and survive in diverse aquatic settings. *Legionellae* are known to form biofilms in aquatic environments as a survival mechanism against adverse conditions.

From a human health perspective, the *Legionella* species, particularly *L. pneumophila,* is important since it is the causative agent of Legionellosis or Legionnaires' disease in humans. According to the journal "Infection Control and Hospital Epidemiology", hospital-acquired *Legionella* pneumonia has a fatality rate of 28 %, with its source being the water distribution system. As per the Center for Disease Control (CDC), in the United States, the disease affects between 8,000 to 18,000 individuals annually with a fatality rate ranging from 5 – 30 %.

Legionellosis or Legionnaires' disease

The *Legionella* species can cause two types of Legionellosis: Legionnaires' disease and Pontiac fever. Legionnaires' disease, also called "Legion Fever", is a severe pneumonia. Pontiac fever is a milder respiratory illness that resembles acute influenza. Legionellosis is not contagious. Common reservoirs of the bacteria include cooling towers, air-conditioning units, swimming pools, domestic hot-water systems and fountains. The primary route of transmission is via aerosols. *Legionella* is generally not a threat to most healthy individuals. However, it can cause serious complications in immunocompromised individuals and in the elderly.

Ordering Information

				Alternative rapid method
Procedure Step	Product Description	Pack Size	Ord. No.	Approval
Sample preparation	Sodium Chloride	1 kg	1.06400.1000	
	Tween 20	1 Ltr	8.17072.1000	
	Bacillus cereus Selective Supplement	10 vials	1.09875.0010	

Reference method

Procedure step	ISO 11731
Membrane filtration + isolation	BCYE Agar, 36 ± 2°C; 3 – 10 days, GVPC Agar, 36 ± 2°C; 3 – 10 days

Listeria monocytogenes and Listeria genus

Listeria is a genus of gram-positive, non-sporeforming, rod-shaped bacteria. Of the six known species of the genus *Listeria*, *Listeria monocytogenes* deserves particular mention as a human and animal pathogen; *L. ivanovii* is only pathogenic in animals, while *L. innocua, L. seeligeri, L. grayi*, and *L. welshimeri* are considered harmless environmental bacteria. They are characterized amongst other things by several factors, including their ability to grow at refrigeration temperatures (2 – 8°C), causing contamination of ready-to-eat foods to pose a serious risk.

Consequently, food legislation in many countries specifies strict limits for *Listeria* spp. or *Listeria monocytogenes*. In the conduct of risk-related quality controls in food, tests should be run for *L. monocytogenes*, and for the *Listeria* Genus in general.

The presence of *Listeria* – in particular of *L. innocua* – is an indicator for critical hygienic conditions in the production process. A drastic increase in the incidence of food infection caused by *Listeria* has resulted in a demand for reliable and rapid methods of detection. Apart from traditional culture methods, immunological techniques are becoming ever more popular with users due to their superior specificity and sensitivity.

To speed up and simplify your pathogen testing routines we now also offer pre-weighed and gamma-irradiated Readybag® media pouches for quick and simple *Listeria* testing.

Listeriosis

Listeria monocytogenes is one of the most widely distributed foodborne pathogens in the world and is responsible for severe infections in immunocompromised persons, pregnant women and neonates. As a result, the mortality rate in infected individuals is high despite the relatively low number of cases around the world.

Listeria infections (listeriosis) can result in anything from mild gastro-enteritis to severe cases of sepsis, meningitis, encephalitis or abortion. Due to the ubiquitous distribution of *Listeria* and their capability to grow at refrigeration temperatures (2 – 8°C), food products constitute one of the main sources of infection.

Ordering Information

		Granulated	Ready-to-use			Reference method			Alternative rapid method	
Procedure Step	Product Description			Pack Size	Ord. No.	ISO 11290-1	BAM Ch. 10	MLG 8.07	Approval	
Pre-enrichment	FRASER Listeria Selective Enrichment Broth (base)	■		500 g	1.10398.0500				■	
	FRASER Enrichment Broth (1/2)		■	6 x 275 ml	1.46476.0006	■				
	FRASER Enrichment Broth (10 ml)		■	20 tubes	1.46208.0020	■				
	FRASER Listeria Supplement I			10 vials	1.00092.0010	■				
	FRASER Listeria Supplement II			10 vials	1.00093.0010	■				
	Readybag® Half Fraser Broth 12.5 g (for 25 gr/ml sample)*	■		60 pcs	1.02449.0060	■			■	
	Readybag® Half Fraser Broth 63 g (for 125 gr/ml sample)*	■		35 pcs	1.01865.0001	■			■	
	Buffered Listeria Enrichment Broth (Base) BLEB	■		500 g	1.09628.0500	■			■	
	Listeria Selective Enrichment Supplement			10 vials	1.11781.0010		■			
	UVM Listeria Selective Enrichment Broth, modified	■		500 g	1.10824.0500			■	■	
Selective/ secondary enrichment	As pre-enrichment	■	■			■	■		■	
	As ISO 11290	■	■					■	■	
Detection	Singlepath® L'mono			25 tests	1.04148.0001				■	
Isolation/ confirmation	Chromocult® Listeria Selective Agar Base	■		500 g	1.00427.0500	■	■			
	Chromocult® Listeria Agar Selective Supplement			10 vials	1.00432.0010	■	■			
	Chromocult® Listeria Selective Agar acc. Ottaviani and Agosti		■	20 plates	1.46186.0020	■	■			
	Oxford Selective Listeria Agar	■		500 g	1.07004.0500	■	■			
	Oxford Listeria Selective Supplement			10 vials	1.07006.0010	■	■			
	Oxford Selective Listeria Agar	■		20 plates	1.46328.0020	■	■			
	Palcam Listeria Selective Agar Base	■		500 g	1.11755.0500	■	■			
	Palcam Listeria Selective Supplement			10 vials	1.12122.0010	■	■			
	Palcam Listeria Selective Agar	■		20 plates	1.46329.0020	■	■			

** Further Readybag® packaging sizes on request*

Reference method

Procedure step	ISO 11290-1	FDA-BAM Chapter 10	FSIS MLG 8.07
Pre-enrichment	Half Fraser Broth, 30 ± 2°C, 24 ± 3 h	bLEB base broth, 30°C, 4 h	UVM, 30 ± 2°C, 22 ± 2 h
Selective enrichment	Fraser Broth, 35 – 37°C, 48 ± 3 h	bLEB w. selective agents added, 30°C, 20 h (44 h)	MOPS-bLEB, 35 ± 2°C, 22 ± 2 h or Fraser Broth, 35 ± 2°C, 24 h (48 h)
Plating	ALOA agar + additional, 24 ± 3 h/ (48 ± 3 h)	Oxford, Palcam, Chromocult® *Listeria*, 35°C, 24 – 48 h	MOX-agar, 35 ± 2°C, 24 ± 2 h

Salmonella

Salmonella is a genus of rod-shaped, gram-negative, non-sporeforming, predominantly motile bacteria, belonging to the *Enterobacteriaceae* family. *Salmonella* spp. are one of the most common causes of food poisoning worldwide and have been isolated from most types of raw food (e.g. meats, eggs and plant products). Their high resistance to drying combined with a very high heat resistance once dried makes *Salmonella* a potential problem in most foods, particularly in dry and semidry products.

Food legislation in many countries includes limits on *Salmonella* – typically absence in 25 g of food.

Traditional microbiological methods for the detection of *Salmonella* in food and animal feed require a total of up to 5 days to obtain a simple yes/no result. For products where a positive release is important, this means a considerable delay before those products can be released into the market. The requirement of food manufacturers for a quicker release of finished products and for cost savings calls for a change in these methods. Thus, rapid methods have become increasingly interesting. The general expectation for a rapid test is to be sensitive and specific, user-friendly and cost-effective.

To speed up and simplify your pathogen testing routines we now also offer pre-weighed and gamma-irradiated Readybag® media pouches for quick and simple *Salmonella* testing.

Salmonellosis

Most individuals infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 – 72 hours after infection. The illness usually lasts 4 – 7 days, and the majority of patients recover without treatment. However, in some cases, the diarrhea may be so severe that hospitalization is required. In these patients, the *Salmonella* infection may spread from the intestines to the blood stream, and then to other body sites. This can result in death unless the person is treated promptly with antibiotics. The elderly, infants, and those with compromised immune systems are more likely to have a severe illness.

Ordering Information

		Granulated	Ready-to-use			Reference method			Alternative rapid method	
Procedure Step	Product Description			Pack Size	Ord. No.	ISO 6579	BAM Ch. 5	MLG 4.05	Approval	
Pre-enrichment	BPW	■		500 g	1.07228.0500	■	■	■	■	AOAC-RI
	Readybag® Buffered Peptone Water 5.7 g (for 25 gr/ml sample)*	■		60 pcs	1.02448.0060	■	■	■	■	AOAC-RI
	Readybag® Buffered Peptone Water 86 g (for 375 gr/ml sample)*	■		35 pcs	1.00908.0001	■	■	■	■	AOAC-RI
	Peptone Water (buffered)		■	225 ml	1.46404.0006	■	■	■	■	AOAC-RI
	Lactose Broth	■		500 g	1.07661.0500		■			AOAC-RI
	TSB	■		500 g	1.05459.0500		■			
Selective/ secondary enrichment	MSRV Medium Base	■		500 g	1.09878.0500	■				
	MSRV Selective Supplement			10 vials	1.09874.0010	■				
	MSRV Medium		■	20 plates	1.46622.0020	■				
	RVS	■		500 g	1.07700.0500	■	■	■	■	AOAC-RI
	RVS		■	20 x 10 ml tubes	1.46694.0020	■	■	■	■	AOAC-RI
	MKTTn	■		500 g	1.05878.0500	■				
	MKTTn		■	20 x 10 ml tubes	1.46221.0100	■				
	Iodine			100 g	1.04761.0100	■	■	■		
	Potassium Iodide			250 g	1.05043.0250	■	■	■		
	Tetrathionate Broth Base	■		500 g	1.05285.0500		■	■		
	Brilliant Green	■		50 g	1.01310.0050		■	■		
	Selenite Cystine Broth	■		500 g	1.07709.0500		■			
	Selenite Cystine Broth		■	20 x 10 ml tubes	1.46178.0020		■			
Detection	Singlepath® Salmonella			25 tests	1.04140.0001				■	AOAC-RI
Isolation/ confirmation	XLD Agar	■		500 g	1.05287.0500	■	■			
	XLD Agar		■	20 plates	1.46073.0020	■	■			
	XLT4 Agar Base	■		500 g	1.13919.0500	■		■		
	XLT4 Agar Supplement			100 ml	1.08981.0100	■		■		
	Rambach Agar	■		4 x 250 ml	1.07500.0001	■				
	Rambach Agar		■	20 plates	1.46719.0020	■				
	Bismuth-Sulfite Agar	■		500 g	1.05418.0500	■	■			
	Hektoen Enteric Agar	■		500 g	1.11681.0500	■	■			

** Further Readybag® packaging sizes on request*

Reference method

Procedure step	ISO 6579:2002; AMD 1:2007	FDA BAM Chapter 5	FSIS MLG 4.05
Pre-enrichment	BPW, 37 ± 1°C; 18 ± 2 h	Lactose broth / TSB / Universal Pre-enrichment Broth / BPW / ..., 35°C; 24 ± 2 h	BPW, 35°C; 21 ± 3 h
Selective enrichment	MKTTBn, 37 ± 1°C; 24 ± 3 h and RVS, 41.5 ± 1°C; 24 ± 3 h or MSRV 41.5 ± 1°C, 24 ± 3 h (48 ± 3 h)	Tetrathionate Broth 43 ± 0.2°C or 35 ± 2.0°C; 24 ± 2 h and RVS, 42 ± 0.2°C; 24 ± 2 h or Selenite Cystine Broth, 35°C, 24 ± 2 h	RVS 42 ± 0.5°C; 22 ± 2 h and Tetrathionate Broth, 42 ± 0.5°C; 20 – 24 h
Plating	XLD agar + additional, 37°C; 24 ± 3 h (48 ± 3 h)	BS agar, XLD agar and Hektoen Enteric agar, 35°C; 24 ± 2 h	BGS agar + XLT4-agar or DMLIA agar, 35 ± 2°C; 21 ± 3 h

Staphylococcus aureus

Staphylococcus aureus is a facultative anaerobic gram-positive coccus, which is non-motile and catalase- and coagulase-positive. Some *S. aureus* strains are able to produce staphylococcal enterotoxins (SEs) and are the causative agents of staphylococcal food poisoning. *Staphylococci* exist in air, dust, sewage, water, milk, and food, as well as on food equipment, environmental surfaces, humans, and animals. Of these, humans and animals are the primary reservoirs. *Staphylococci* are present in nasal passages as well as throats and on the hair and skin of 50 percent or more of healthy individuals.

Staphylococcus aureus is able to grow in a wide range of temperatures (7 – 48.5°C, with an optimum of 30 – 37°C), pH (4.2 to 9.3, with an optimum of 7 – 7.5) and sodium chloride concentrations (up to 15 % NaCl). These characteristics enable *S. aureus* to grow in a wide variety of foods.

Foods that are frequently incriminated in staphylococcal food poisoning include meat and meat products, poultry and egg products, salads (e.g. egg, tuna, chicken, potato, and macaroni), bakery products (e.g. cream-filled pastries, cream pies, and chocolate éclairs), sandwich fillings and milk and dairy products. Foods that require considerable handling during preparation and are kept at slightly elevated temperatures after preparation are frequently involved in staphylococcal food poisoning.

Staphylococcus intoxication

The cause of the illness is preformed toxins, and it is therefore characterized by a very short incubation time – typically from 0.5 – 6 hours, depending on the general health of the victim, susceptibility to the toxin, the concentration of toxin, and the amount of food ingested. The infective dose may be less than 1.0 microgram, which is equivalent to 100,000 cfu/g.

The most common symptoms of *Staphylococcus* infection are nausea, vomiting, retching, abdominal cramping, and diarrhea. Recovery typically takes 1 – 3 days, but in severe cases complete recovery may take longer. The illness is not transmissible and does not normally require treatment beyond rest and plenty of fluids.

Ordering Information

		Granulated	Ready-to-use			Reference method			Alternative rapid method	
Procedure Step	Product Description			Pack Size	Ord. No.	ISO 6888	BAM Ch. 12	MLG	Approval	
Enrichment	Giolitti-Cantoni Broth	■		500 g	1.10675.0500	■				
	Potassium Tellurite Trihydrate	■		100 g	1.05164.0100	■				
	Paraffin, viscous			1 liter	1.07160.1000	■				
	TSB	■		500 g	1.05459.0500		■			
	Sodium Chloride			1 kg	1.06400.1000		■			
	Sodium Pyruvate			50 g	1.06619.0050		■			
Isolation/ confirmation	Baird-Parker Agar (Base)	■		500 g	1.05406.0500	■	■			
	Baird-Parker Agar		■	20 plates	1.46137.0020	■	■			
	Mannitol Salt Agar – LI 30 ml		■	20 plates	1.46023.0020					
	Egg Yolk-Tellurite Emulsion			10 x 50 ml	1.03785.0001	■	■			
	Brain Heart Broth	■		500 g	1.10493.0500	■	■			
	Brain Heart Broth		■	20 x 9 ml tubes	1.46732.0020	■	■			
	Bactident® Coagulase			6 vials	1.13306.0001	■	■			

Reference method

Procedure step	ISO 6888	FDA BAM Chapter 12
Enrichment (MPN)	Modified Giolitti and Cantoni Broth, 37 ± 1°C, 24 (48) ± 2 h	TSB + 10 % NaCl + 1 % Sodium Pyruvate
Isolation (MPN) and/ or direct plate count	Baird-Parker Agar or Rabbit Plasma Fibrinogen Agar, 37 ± 1°C, 24 (48) ± 2 h	Baird-Parker Agar
Confirmation	Rabbit Coagulase test	Rabbit Coagulase test

MPN = most probable number

Vibrio cholerae

Members of the genus *Vibrio* are defined as gram-negative, asporogenous, motile rods that are straight or comma-shaped. *Vibrio cholerae* is a strictly aqueous organism and brackish and marine waters are natural environments for the etiologic agents of cholera, *Vibrio cholerae* O1 or O139. The main route of transmission is fecal-oral, indirectly via polluted water supplies or irrigation water. Another common source is contaminated shellfish that is raw or undercooked.

Cholera

Cholera is an infection of the small intestines caused by cholera enterotoxin (CT) producing *Vibrio cholerae* of serogroups O1 and O139. Other serogroups and non-toxigenic strains may cause similar diseases, but are rarely involved in large outbreaks and are not reported by the WHO as cholera.

The symptoms are often mild, but up to 10 % of patients may experience classical cholera symptoms with profuse watery diarrhea ("rice-water stool") and often vomiting. This can lead to rapid dehydration (up to 25 liters per day) and electrolyte imbalance. Standard treatment consists of oral rehydration therapy with a sugar and electrolyte solution or, in severe cases, intravenous rehydration. Untreated cholera is often fatal due to dehydration and shock.

Ordering Information

		Granulated	Ready-to-use			Reference method			Alternative rapid method	
Procedure Step	Product Description			Pack Size	Ord. No.	ISO 21872	BAM Ch. 9	MLG	Approval	
Enrichment	Alkaline Peptone Water	■		500 g	1.01800.0500	■	■			
Isolation/ confirmation	TCBS Agar	■		500 g	1.10263.0500	■	■			

Reference method

Procedure step	ISO 21872	FDA BAM Chapter 9
1st selective enrichment	Alkaline Saline Peptone Water 37 ± 1°C or 41.5 ± 1°C (fresh products); 6 ± 0.5 h	Alkaline Peptone Water 35 ± 2°C; 7 ± 1 h (18 – 21 h for processed foods) / 42 ± 0.2°C; 18 – 21 h for raw oysters
2nd selective enrichment	Alkaline Saline Peptone Water 41.5 ± 1°C; 18 ± 1 h	N/A
Plating	TCBS Agar, 37 ± 1°C; 21 ± 3 h additional medium of choice	TCBS Agar, 35 ± 2°C; 21 ± 3 h

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Lit. No. PB2228EN00MM 12/2014

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