

There is more to food safety than meets the eye. Pathogen Testing by Merck Millipore.

Dehydrated Culture Media | Real-Time PCR Kits | Immunoassays: Lateral Flow Tests



More solutions. More know-how. One source.

All you need

Rapid, reliable food testing is the challenge of every manufacturer. Our formula for your success: One source for the whole range. At Merck Millipore, we provide our customers with dependable, complete packages that address your food testing needs across the entire application process. With our extensive portfolio, you'll not only have rapid, reliable results, but also benefit from superior product quality, while appreciably reducing your laboratory costs and production times. And when you need professional support, you can rely on our in-depth expertise and dedicated service.

Simply seamless

Our wide-ranging solutions span all steps of the analysis: pre-enrichment, selective enrichment, sample preparation, and detection. For both phases of enrichment, Merck Millipore is the largest provider of dehydrated and unique granulated media. These ensure efficient growth of potential pathogenic organisms from numerous food matrices. Our easy-to-use sample preparation products generate pure, inhibitor-free DNA or RNA for fast molecular detection using real-time PCR. The range consists of simple yet sophisticated kits that offer the highest sensitivity and specificity with results in just 24 hours. And our innovative Lateral Flow Tests for immunological detection allow you to perform direct analysis without sample preparation. They supply swift presence/absence answers in one easy step and deliver results within 24 to 48 hours – independent of additional equipment expenditure.

Quick, comprehensive and convenient: that's how we define new standards in food safety. Discover how you can test for the best results.



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Dehydrated culture media The basis for success

Experience counts and Merck Millipore clearly sets the standard with 121 years of cumulative expertise in developing innovative culture media. As a leader in this field, we offer state-of-the-art, turnkey solutions that present a comprehensive approach to your needs. Our product portfolio spans more than 300 dehydrated culture media formulations, and we are constantly expanding our range. What's more, we not only ensure outstanding quality and variety, but also flexible quantities. No requirement is too big or too small for us to handle.

Safe, standardized and comprehensive solutions are the cornerstones of Merck Millipore's philosophy. These features distinguish our products from other suppliers' and demonstrate our performance at its best. Our reliability is the result of meticulous quality control.

Granulated culture media

Merck Millipore's unique granulated culture media are convenient, safe and meet the highest industry performance standards as described in ISO 11133. Additionally, granulation significantly reduces inhalation of hazardous media components and consequent allergic responses, as well as minimizing contamination of the working environment.

All animal components (except some milk derived) are sourced from TSE/BSE-free countries and adhere to the highest safety standards. Our careful selection of premium raw materials ensures high recovery and growth rates of bacteria, which are essential for the subsequent use of rapid testing methods. The excellent free-flowing properties, wettability and solubility of our granulated media make them much easier to use than traditional media. Unlike powdered media, granulation offers greater homogeneity, minimizing component separation and clumping, even under warm or humid conditions, prolonging the shelf life of the products for up to 5 years. In many cases, the unique granulation process allows the inclusion of supplements. Your advantage: no extra work and no extra costs for buying supplements separately.

Safer	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
Easier	Superior flow properties and non-sticking media ensure easier handling
Reliable	Homogenous distribution of ingredients assures high reproducibility even with small media quantities



Rapidcult[™]

Due to a recent rise in foodborne illness, the food market is becoming increasingly regulated, leading to a greater demand for rapid testing methods. However, it's not only about rapid testing; fast enrichment of pathogens is also equally essential.

To answer this need, Merck Millipore has developed the new granulated Rapidcult^M *E. coli*. This highly specialized medium enables the enrichment of EHEC bacteria within just 8–12 hours – ready for subsequent rapid screening of *E. coli* 0157 by either foodproof[®] Real-Time PCR or Singlepath[®] *E. coli* 0157.

In addition, Rapidcult[™] is the perfect complement to the Duopath[®] Verotoxins Lateral Flow Kit. It is designed for accelerated enrichment of Verotoxin-producing EHEC and subsequent detection of the Verotoxin (Shiga-Toxin) using Duopath[®] Verotoxins Kit, providing confirmed results in 24 hours.

Advanced technology Molecular detection using real-time PCR

Polymerase Chain Reaction (PCR) has gained appeal in industrial microbiology as a powerful technology for the rapid detection of microorganisms. This molecular method enzymatically amplifies a few copies of the target DNA molecule to generate millions of identical molecules. The process relies on thermal cycling, typically consisting of 35 to 50 cycles of repeated heating and cooling to melt double-stranded DNA and to generate new DNA strands from single-stranded DNA using *Taq* DNA Polymerase. To check if the anticipated DNA fragment has been generated, classical PCR requires agarose gel electrophoresis for size-defined separation of the amplified products and for visualization.

A more convenient approach is the application of real-time PCR. In contrast to classical PCR, this method relies on fluorescence measurements to enable the visualization of PCR products during the amplification process. Real-time PCR uses either fluorescence dyes (e.g., SYBR Green) or fluorescent DNA probes, such as TaqMan® or Hybridization Probes – a state-of-the-art design that ensures the highest reliability of results.



Real-time PCR technology

The figure illustrates a typical real-time PCR result, showing increases in fluorescence from different samples throughout the thermal cycler run. The increase in fluorescence over the threshold is strongly dependent on the amount of starting template. A smaller Ct-value (cycle number where the fluorescence intensity is above a threshold level) indicates a higher amount of starting template than a greater Ct-value. Such real-time PCR results not only allow the determination of presence/ absence, but can also be used for quantification.



Merck Millipore Real-Time PCR Detection Kits allow maximum customer flexibility, since they operate on two different probe-based detection systems:

- 5' Nuclease (TaqMan[®]) probes
- Hybridization Probes using fluorescence resonance energy transfer (FRET) technology

Two different probe systems for maximum customer flexibility

TaqMan[®] (5' Nuclease) probes

TaqMan[®] probes are sequence-specific oligonucleotide probes carrying a fluorophore and a quencher. The fluorophore is attached at the 5' end of the probe and the quencher is located at the 3' end. During the combined annealing/extension phase of PCR, the probe is cleaved by the 5' \rightarrow 3' exonuclease activity of *Taq* DNA polymerase, separating the fluorophore and the quencher. This results in detectable fluorescence that is proportional to the amount of accumulated PCR product.



TaqMan[®] technology does not offer identification of organisms by melting curve analyses since the probes are digested during amplification.

Our foodproof[®] Real-Time PCR Detection Kits are multiplex kits, such as *Campylobacter*, *Brucella*, *Alicyclobacillus* and GMO screening, which enable individual identification by generating specific signals in different fluorescence channels.

Hybridization probes

Our foodproof[®] Kits with Hybridization Probes technology are compatible with LightCycler[®] instruments. This method also allows specific identification of organisms by melting curve analysis with the foodproof[®] Beer Screening and *Campylobacter* Kits because the probes used during the amplification remain intact.

PCR with fluorescence resonance energy transfer (FRET) probes, such as LightCycler[®] Hybridization Probes, uses two labeled oligonucleotide probes that bind to the PCR product in a head-to-tail fashion. When the two probes bind, their fluorophores come into close proximity, allowing energy transfer from a donor fluorophore to an acceptor fluorophore. Therefore, fluorescence is detected during the annealing phase of PCR and is proportional to the amount of PCR product. Hybridization Probes usually carry dyes that are only compatible with LightCycler[®] instruments.



LightCycler[®] instruments require color compensation for use with foodproof[®] Kits to ensure optimal results and avoid cross-fluorescence. Color compensation is required only once. For this purpose, Merck Millipore also offers a variety of Color Compensation Kits.

Convenient DNA isolation to suit your needs: Sample preparation solutions

Even after diluting samples in culture media, ingredients from food matrices can heavily influence real-time PCR results. Efficient sample preparation with effective inhibitor removal is therefore the key to successful amplification of DNA by real-time PCR.

Our foodproof[®] ShortPrep, StarPrep and further sample preparation kits help you easily isolate DNA from particularly difficult sample materials.

To suit the complexity of your sample matrix and budget, we offer a selection of kits for convenient, bulk and rapid sample preparation, as well as for manual or fully automated DNA extraction.



Our comprehensive portfolio:

- foodproof® ShortPrep Kit Convenience format with pre-dispensed, ready-to-use lysis buffer
- foodproof® StarPrep Kits Economy format with bulk lysis buffer
- foodproof® Sample Preparation Kits Column-based DNA extraction format for difficult matrices
- foodproof® Magnetic Preparation Kit DNA extraction kit for automated sample preparation

The **foodproof®** ShortPrep Kits are designed for rapid and convenient isolation of bacterial DNA from bacterial enrichment culture. All kits include a pre-dispensed lysis buffer devoid of hazardous organic or chaotropic reagents. The entire DNA preparation can be performed in a single tube, minimizing handling steps. With this ready-to-use format, preparation of one sample takes less than 10 minutes*, thus saving you valuable time. In addition, it minimizes cross-contamination risks since pipetting of DNA extracts is not required.

The **foodproof**[®] **StarPrep Kits** offer an economical format for the isolation of bacterial DNA from bacterial enrichment culture in less than 15 minutes^{*}. The kits include a lysis buffer in a larger container from which aliquots can be taken and added to the prepared enrichment culture. Subsequently, DNA preparation is performed in a single tube, minimizing handling steps.

The **foodproof**[®] **Sample Preparation** Kits are optimized for isolation of bacterial DNA from enrichment cultures of various difficult food samples or plant DNA, even those with a high potential for PCR inhibition (such as raw materials and processed food). After enzymatic treatment, a bind-wash-elute procedure is performed using special glass fibers that are pre-packed in a filter tube.

The foodproof[®] Magnetic Preparation Kit I provides purification of Gram-negative bacterial DNA from enrichment cultures of food samples using a fully automated, robotic workstation**. The kit provides high-quality DNA, which is suitable for direct use in PCR applications. After cell-lysis, the DNA is selectively bound to magnetic beads, and a few washing steps ensure clean-up.

- * Processing multiple samples in parallel can reduce the preparation time per sample to about 1–5 minutes, depending on sample and preparation kit types
- ** The foodproof® RoboPrep Series workstations are available through BIOTECON Diagnostics



State-of-the-art molecular detection: Versatile foodproof[®] Real-Time PCR Kits

Merck Millipore's foodproof[®] Detection Kits operate on the powerful real-time PCR technology. These molecular tests use either TaqMan[®] or Hybridization Probes and are designed to amplify sequence-specific DNA targets. The advantage is that they allow real-time visualization of target DNA amplification thereby confirming the presence or absence of target organisms within 60 to 90 minutes. foodproof[®] Detection Kits offer superior specificity and sensitivity combined with speed and accuracy.

In combination with the foodproof[®] Sample Preparation Solutions the versatile foodproof[®] Real-Time PCR Kits enable the detection of food pathogens, spoilage organisms and GMOs in a variety of foods such as:

- Meat and meat products
- Fish
- Dairy
- Fresh produce
- Ready-to-eat foods
- Beverages such as beer, wine, juices
- Dehydrated infant formulas

- Chocolates
- Spices
- Whole grains
- Peanut butter
- as well as environmental samples from primary production, whether swabs or residues
- and many more food matrices



Our foodproof[®] Real-Time PCR Kits are self-contained. They include all necessary reagents, enzymes and buffers, as well as positive, negative and internal amplification controls. Besides separate positive and negative control reactions, ISO also recommends including an internal amplification control (IAC) during each target reaction for real-time PCR food testing. This important step verifies whether any impurity in extracted DNA could have led to inhibition of the PCR reaction and avoids false negative results.

A detailed instruction manual and thermal cycle programming manual are also available to make handling easy, rapid and accurate. All kits meet the latest ISO standards for real-time PCR food and environmental testing.

In addition, foodproof[®] Real-Time PCR Kits boast a unique, internal safety feature: Uracil-N-Glycosylase. Included in each PCR reaction, this enzyme eliminates potential contamination from carry-over DNA from previous PCR reactions, thus ensuring reliable results every time!

High efficiency	Detection of 1–10 cells per sample from 25 g sample size for most food matrices reduces the risk of false negative results
High speed	Less than 24 hours time-to-result including pre-enrichment reduces release times and costs
Complete convenience	Includes all reagents necessary for detection as well as positive, negative and internal amplification controls
Superior safety	All probe-based detection kits contain Uracil-N-Glycosylase to prevent carry-over contaminations and false-positive results

Merck Millipore foodproof[®] Real-Time PCR Kits offer a comprehensive portfolio for the detection and screening of:

Brucella	→ 24
Campylobacter	→ 26
<i>E. coli</i> 0157	→ 30
Enterobacteriaceae & Enterobacter sakazakii (Cronobacter spp)	→ 32
Listeria monocytogenes & Listeria Genus	→ 36
Salmonella	→ 40
Shigella	→ 42
Beer spoilage bacteria	→ 49
Saccharomyces cerevisiae var. diastaticus	→ 50
Dekkera (Brettanomyces)	→ 51
Alicyclobacillus	→ 52
GMO screening	→ 55
GMO maize quantification	→ 56
GMO soya quantification	→ 56

Perfect extension: MMB Food Pathogen System

The MMB Food Pathogen System expands the existing foodproof[®] Real-Time PCR portfolio to offer a complete range of solutions for the detection of all major food pathogens.

This comprehensive system consists of matched kits, combining those for the isolation of nucleic acids (MMB Food Pathogen Prep Kits) with kits for real-time PCR-based detection of food samples (MMB Food Pathogen Detection Kits). The kits are optimized for versatile use on a broad range of real-time cyclers, including instruments from Applied Biosystems, Agilent, BioRad, Eppendorf, QIAGEN and Roche.

All tests follow the same simple procedure of enrichment/concentration, sample preparation and real-time PCR detection. Fail-safe analysis is completed within a few hours of enrichment, ensuring a short time-to-result for fast product release. Identical amplification protocols for all microorganisms allow different tests to be performed in a single run. Simultaneous amplification of the desired target DNA and of an internal control DNA excludes false negative results. The use of a Hot-Start enzyme for amplification further increases sensitivity.

Technology	MMB V		MMB R		MN	IB LC
	λ_{D}	λ	λ_{D}	λ	λ _D	λ
Wavelength detection system	FAM 522 nm		FAM 522 nm		FAM 522 nm	
Wavelength inhibition control		VIC 553 nm		ROX 602 nm		LC (F2) 640 nm
Real-time thermal cycler	 ABI 7000, 7 7700, 7900 StepOne Eppendorf ep realplex Agilent/Str Series Corbett/QL Gene 	7300, 7500,) SDS, ep realplex, atagene Mx AGEN Rotor	 BioRad iCy BioRad iQ5 BioRad Chr Roche LightCycler 	cler 5 romo4 r 480	• Roche LightCycler 1.5 LightCycler 2.0	

Overview of the MMB Food V, R or LC Kits and their use on the appropriate real-time thermal cycler

Fast assay procedure	Optimized pre-enrichment, isolation and detection
Robust application	Optimal results from demanding food matrices
Sensitive detection	Less than 5 DNA copies

The MMB Food Pathogen System allows fast and sensitive detection of foodborne bacteria, including:

Bacillus cereus	→ 22
Clostridium perfringens	→ 28
Legionella	→ 34
Viruses such as Norovirus	→ 38
Staphylococcus aureus	→ 44
Vibrio cholerae	→ 46



Pathogen detection of the next generation Singlepath[®] & 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.

Singlepath

Singlepath® ECOLI 0157

Duopath

Duopath^{dl.} Rotoxins

Reliable	Same accuracy standards as classical detection method
Comprehensive	Tests cover six most relevant pathogens in food
Fast	Definite results within 20-30 minutes
Easy to use	Clear yes/no results after simple sample application
Safe	Additional positive control and specially adapted enrichment media for precise, reliable results
Economic	Rapid results save operating costs by expediting product release while ensuring product reliability

What's your application?

Merck Millipore 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:

-

Bacillus cereus – Entereotoxins/Emetic toxin	→ 22
Campylobacter	→ 26
EHEC – Verotoxins	→ 30
Legionella/Legionella pneumophila	→ 34
Listeria monocytogenes & Listeria Genus	→ 36
Salmonella	→ 40

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 complimentary antigenic determinant to provide a visual reaction read-out.





Enrichment: specially adapted media for precise and reliable results

Specially adapted enrichment media form the necessary base for precise and reliable test results. You benefit from our many years of experience with classical enrichment media – we have exactly adapted the various broths to match the innovative technology of the Lateral Flow Tests. This saves you having to perform the time-consuming preparation steps yourself and also secures the quality of the results. With the all-in-one package containing the enrichment media and the Lateral Flow Tests now a highly expressive test instrument is available that helps to appreciably reduce laboratory costs, and the time it takes to bring products to market.

Depending on the type of organism, enrichment is typically a single overnight enrichment; although for a few parameters, an additional selective enrichment or a 48-hour enrichment period may be required.

Product Solutions: Pathogens – Beverage spoilage – Genetically Modified Organisms

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 detection of each individual pathogen is listed.

Finally, a separate section contains information regarding the quality control parameters available for the beverage industry and for the detection of Genetically Modified Organisms (plants).

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



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 milk 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-haemolytic enterotoxin (NHE) is produced by more than 90% and Haemolysin 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*.

In addition to this, some *Bacillus cereus* strains produce a different, heat stable toxin known as *Bacillus cereus* emetic toxin. This toxin is assumed to be pre-formed in the food and is often associated with starchy products, such as rice and pasta. For these reasons, it is becoming increasingly relevant to test foods for toxin-forming *Bacillus cereus* using reliable and rapid testing methods.



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Procedure step	Reference	Product description	Pack size	Ord. No.	Å	\$	Approvals
Enrichment	ISO 21871	TSB	500 g	1.05459.0500			
	BAM Ch. 14	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			
Sample preparation		MMB Bacteria Prep Kit	100 tests	1.44030.0100			
Detection		MMB Bacillus cereus (V) Kit	100 tests	1.44035.0100			
		MMB Bacillus cereus (R) Kit	100 tests	1.44315.0100			
		MMB Bacillus cereus (LC) Kit	100 tests	1.44316.0100			
		Duopath [®] cereus Enterotoxins	25 tests	1.04146.0001			
		Singlepath [®] Emetic Tox Mrk	25 tests	1.04154.0001			
Isolation/confirmation	ISO 21871	MYP Agar Base	500 g	1.05267.0500			
	BAM Ch. 14	Bacillus cereus Selective Supplement	10 vials	1.09875.0010			
	MLG 12	Egg Yolk Emulsion (sterile)	100 ml	1.03784.0001			

Reference methods

Procedure step	ISO 21871	FDA BAM Chapter 14	FSIS MLG 12
Enrichment	TSPB, $30\pm1^{\circ}C$; 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; 20–24 h
	MYP Agar, 30°C; 18–24 h (48 h)		



Brucella

Genus *Brucella* is represented by Gram-negative, non-motile, non-encapsulated, non-sporulating cocobacilli. They are strict aerobes with complex and fastidious nutritional requirements in laboratory cultures. Animals are the primary reservoir of the bacteria, which have been isolated from cattle, cows, sheep, goats, pigs and dogs. To date, 6 species of *Brucella* have been identified: *B. abortus, B. melitensis, B. suis, B. ovis, B. canis,* and *B. neotomae*, all of which have been isolated from animals. *Brucella* causes complications related to infertility, spontaneous abortions and reproductive disorders in cattle and small ruminants.

The foodproof[®] *Brucella* Detection Kit is suitable for confirmation of isolated colonies and detection/ identification from enrichment cultures of food products (e.g. milk and milk products). The test detects all 6 species of *Brucella* and confirms identity of *Brucella abortus* and *Brucella melitensis*.

For the analysis of foods. Not intended for in vitro diagnostic or veterinary diagnostic purposes.

Brucellosis

In humans, the species *B. abortus*, *B. melitensis*, *B. suis*, and *B. canis* may cause the infectious disease brucellosis, also called undulant fever, or Malta fever. Brucellosis is associated with a range of flu-like symptoms including fever, profuse sweating, headaches, back pains, and physical weakness. Severe infections of the central nervous systems or lining of the heart may occur. Brucellosis can also cause long-lasting or chronic symptoms such as recurrent fevers, joint pain, and fatigue.

Brucellosis is a highly contagious zoonosis (infectious disease transmitted from animals to humans) caused by eating raw minced meat, contaminated or untreated milk (and its derivatives) or through direct contact with infected animals like cattle, sheep, dogs or pigs. Common microbiological and serological methods for the detection and identification of *Brucella* spp. are very time-consuming and pose a high risk of infection for laboratory staff.

Approvals

Ordering information

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Procedure step	Reference	Product description	Pack size	Ord. No.	Re	e2	Approv
Sample preparation		foodproof [®] ShortPrep II Kit	96 tests	1.20471.0001			
		foodproof® Sample Preparation Kit II	96 tests	1.20474.0001			
Detection		foodproof [®] Brucella Detection Kit,	96 tests	1.20454.0001			
		5' Nuclease					

Reference method

Procedure step	OIE Terrestrial Manual 2008*, Chapter 2.4.3					
Isolation	Brucella Agar	TSPB, 30±1°C; 48±4 h	N/A			
	Farrell's medium					
	modified Thayer-Martin medium					
	37°C, 10% CO ₂ , 5–28 days					



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 only available 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.

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Procedure step	Reference	Product description	Pack size	Ord. No.	8	(a)	Approvals
Enrichment	¹ ISO 10272-1	^{1,2,3} Bolton Selective Enrichment Broth	500 g	1.00068.0500			AOAC-RI
	² BAM Ch. 7	Base					
	³ MLG 41.00	^{1,2,3} Bolton Broth Selective Supplement	10 vials	1.00079.0010			
		³ BPW	500 g	1.07228.0500			
Sample preparation		foodproof [®] ShortPrep II Kit	96 tests	1.20471.0001			
		foodproof [®] Sample Preparation Kit II	96 tests	1.20474.0001			
Detection		foodproof [®] Campylobacter Detection	96 tests	1.20468.0001			
		Kit, Hybridization Probes (for LC 1.x,					
		2.0, 480)					
		foodproof® Campylobacter Detection	96 tests	1.20460.0001			
		Kit, 5' Nuclease					
	¹ AOAC-RI 120401	Singlepath® Campylobacter	25 tests	1.04143.0001			AOAC-RI
Isolation/confirmation	ISO 10272-1	mCCD Agar	500 g	1.00070.0500			
	BAM Ch. 7	CCDA Selective Supplements	10 vials	1.00071.0010			
		Columbia Blood Agar Base	500 g	1.10455.0500			

1,2,3 Product description refers to reference method.

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,	Bolton Broth, 37±1°C; 4 h,	N/A
	microaerophilic	microaerophilic or 30°C, 3 h + 37°C,	
		2 h microaerophilic	
Selective enrichment	Bolton Broth 41.5°C, 44±4 h	Bolton Broth 42°C, 20 and 44 \pm 4 h,	BPW + 2 x Blood-Free Bolton Broth,
	microaerophilic	microaerophilic	42±1°C; 48±2 h, microaerophilic
Isolation	mCCD agar + additional, 41.5°C;	mCCD agar or AHB Agar, 37–42°C;	Campy-Cefex Agar, $42\pm1^{\circ}$ C; 48 ± 2 h,
	44±4 h, microaerophilic	24-48 h, microaerophilic	microaerophilic



The PCA

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 cool 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 10⁸ vegetative cells. Toxin production is associated with sporulation in the digestive tract.





Procedure step	Reference	Product description	Pack size	Ord. No.	Aca	le?	Approvals
Enrichment		Thioglycolate Broth (anaerobic)	500 g	1.08190.0500			
Sample preparation		MMB Bacteria Prep Kit	100 tests	1.44030.0100			
Detection		MMB Clostridium perfringens (V) Kit	100 tests	1.44036.0100			
		MMB Clostridium perfringens (R) Kit	100 tests	1.44313.0100			
		MMB Clostridium perfringens (LC) Kit	100 tests	1.44314.0100			
Sample dilution	ISO 7937	Maximum Recovery Diluent	500 g	1.12535.0500			
Isolation/confirmation	ISO 7937	TSC Agar Base	500 g	1.11972.0500			
	BAM Ch. 16	Clostridium perfringens	10 vials	1.00888.0010			
	MLG 13.0	Selective Supplement					
		Egg Yolk Emulsion	10x100 ml	1.03784.0001			

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	Sulfite-Cycloserine Agar (TSC w/o	TSC Agar w/ egg yolk, overlay w/o egg
	egg yolk), 37°C; 20±2 h, anaerobic	egg yolk), 35°C; 20±2 h, anaerobic	yolk, 35°C; 24 h, anaerobic
Confirmation	Fluid Thioglycollate medium,	Fluid Thioglycollate medium,	Fluid Thioglycollate medium,
	37°C / 35°C, 21±3 h, anaerobic	35°C, 21 <u>+</u> 3 h	35°C, 21 <u>+</u> 3 h
	Lactose Sulfite medium,	Nitrate Motility medium, 35°C, 24 h,	Nitrate Motility medium, 35°C, 24 h,
	46°C, 21±3 h / Nitrate Motility	anaerobic	anaerobic
	medium, 37°C, 24 h, anaerobic		



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Time

Escherichia coli 0157 / 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 enterohaemorrhagic *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.

In addition to tests for the most common cause of infection, *E. coli* 0157, we offer a 24-hour screening protocol for VTEC, including *E. coli* 0104:H4, based on Rapidcult[™] *E. coli* enrichment combined with detection using Duopath[®] Verotoxins.

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* 0157, other serotypes, such as 026, 045, 0103, 0111, 0121, and 0145, 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 inform	ation				IL TIME	eral Flor	M
Procedure step	Reference	Product description	Pack size	Ord. No.	8	le?	Approvals
Enrichment	ISO 16654 MLG 5.05	mTSB	500 g	1.09205.0500	•	-	AOAC-RI
	BAM Ch 4A	BPW (basis for mBPWp)	500 g	1.07228.0500			
Alternative enrichment		Rapidcult™ <i>E. coli</i>	500 g	1.00026.0500			
Sample preparation	AOAC-RI 100601 NordVal 026	foodproof [®] ShortPrep II Kit	96 tests	1.20471.0001	•		AOAC-RI NordVal
		foodproof [®] StarPrep One Kit	100 tests	1.20476.0001			
		foodproof [®] Sample Preparation Kit I	96 tests	1.20473.0001			
		foodproof® Magnetic Preparation Kit I	480 tests	1.20488.0001			
		Reagent P	550 tests	1.20494.0001			
Detection	AOAC-RI 100601 NordVal 026	foodproof [®] <i>E. coli</i> 0157 Detection Kit, Hybridization Probes (for LC 1.x, 2.0)	96 tests	1.20446.0001	•		AOAC-RI NordVal
	AOAC-RI 10060	foodproof [®] <i>E. coli</i> O157 Detection Kit – 5' Nuclease	96 tests	1.20455.0001	•		AOAC-RI
	A0AC-RI 010407	Singlepath® E. coli 0157	25 tests	1.04141.0001			AOAC-RI
Detection/	A0AC-RI 020402	CAYE Broth Base	100 g	1.00060.0100	-		AOAC-RI
confirmation		CAYE Broth Supplement	10 vials	1.00051.0010			AOAC-RI
		Duopath [®] Verotoxins	25 tests	1.04144.0001			AOAC-RI
		Bacillus cereus Selective Supplement	10 vials	1.09875.0010			AOAC-RI
Isolation/confirmation	ISO 6579	Sorbitol MacConkey Agar (SMAC Agar)	500 g	1.09207.0500			
	BAM Ch. 4A	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;	Immunomagnetic separation
		18–24 h	
		Optional Immunomagnetic	
		separation	
Isolation	CT-SMAC agar, 37°C; 18–24 h	CT-SMAC Agar + chromogenic	Rainbow 0157 Agar, 35±2°C; 24–26 h
		agar (Rainbow 0157 Agar or R&F	
		<i>E. coli</i> 0157 Agar), 37±1°C; 18–24 h	



Enterobacteriaceae & 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* 0157, *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. The combined *Enterobacteriaceae/Enterobacter sakazakii* Detection Kit enables manufacturers to comply with the EU Regulation. The Kit further allows additional testing for *Salmonella* for samples that were previously tested positive for *Enterobacteriaceae*.



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.

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Procedure step	Reference	Product description	Pack size	Ord. No.	Å.	le)	Approvals
Pre-enrichment	ISO TS 22964	BPW	500 g	1.07228.0500			MicroVal
	MicroVal 2007LR09						
	MicroVal 2007LR20						
Selective/secondary	ISO TS 22964	LST Broth	500 g	1.10266.0500	•		
enrichment		Sodium Chloride	1 kg	1.06400.1000			
		Vancomycin (Calbiochem)	250 mg	627850			
	FDA	EE-Broth	500 g	1.05394.0500			
Sample preparation	MicroVal 2007LR09/	foodproof [®] StarPrep One Kit	100 tests	1.20476.0001			MicroVal
	2007LR20						
		foodproof® Magnetic Preparation	480 tests	1.20488.0001			
		Kit I					
		Reagent P	550 tests	1.20494.0001			
Detection		foodproof® Enterobacter sakazakii	96 tests	1.20466.0001			
		Detection Kit, Hybridization Probes					
	MicroVal 2007LR09	foodproof [®] Enterobacteriaceae and	96 tests	1.20489.0001			MicroVal
		Enterobacter sakazakii Detection Kit,					
		Hybridization Probes (for LC 2.0, 480)					
	MicroVal 2007LR20	foodproof [®] Enterobacteriaceae and	96 tests	1.20456.0001			MicroVal
		Enterobacter sakazakii Detection Kit,					
		5' Nuclease					
Isolation/confirmation	ISO TS 22964	Chromocult [®] Enterobacter sakazakii	500 g	1.00873.0500			
		Agar					
	FDA	VRBD Agar	500 g	1.10275.0500			

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,	VRBD. 16–24 h at 36°C
	44±1°C, 24 h	

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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%.

For the analysis of environmental and water samples. Not intended for in vitro diagnostic purposes.

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						teral Fi	140.
Procedure step	Reference	Product description	Pack size	Ord. No.	4	(a)	Approvals
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			
		MMB Bacteria Prep Kit	100 tests	1.44030.0100			
Detection		MMB Legionella Screening Kit (V)	100 tests	1.44034.0100			
		MMB Legionella Screening Kit (R)	100 tests	1.44317.0100			
		MMB Legionella Screening Kit (LC)	100 tests	1.44318.0100			
		MMB Legionella pneumophila Detection Kit (V)	100 tests	1.44037.0100			
		MMB Legionella pneumophila Detection Kit (R)	100 tests	1.44311.0100			
		MMB Legionella pneumophila Detection Kit (LC)	100 tests	1.44312.0100			
Confirmation		Duopath® Legionella	25 tests	1.04147.0001			

Reference method

Procedure step	ISO 11731
Membrane filtration	BCYE Agar, $36\pm 2^{\circ}$ C; 3–10 days, GVPC Agar, $36\pm 2^{\circ}$ C; 3–10 days
+ isolation	



Listeria monocytogenes & 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.

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 gastroenteritis 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 intor	mation				L'II	era)	
Procedure step	Reference	Product description	Pack size	Ord. No.	Å.	le7	Approvals
Pre-enrichment	ISO 11290-1	FRASER Listeria	500 g	1.10398.0500			AOAC-RI
		Selective Enrichment Broth (base)					
		FRASER Listeria Supplement I	10 vials	1.00092.0010			
		FRASER Listeria Supplement II	10 vials	1.00093.0010			
	BAM Ch. 10	Buffered Listeria Enrichment	500 g	1.09628.0500			
		Broth (Base) BLEB					
		Listeria Selective Enrichment	10 vials	1.11781.0010			
		Supplement					
	MLG 8.07	UVM Listeria Selective Enrichment	500 g	1.10824.0500			
		Broth, modified					
Selective/secondary	ISO 11290-1	As pre-enrichment					
enrichment	BAM Ch. 10	As pre-enrichment					
	MLG 8.07	As ISO 11290					
Sample preparation	AOAC-RI 070401	foodproof [®] ShortPrep II Kit	96 tests	1.20471.0001			AOAC-RI
	NordVal 025				_		NordVal
		foodproof [®] Sample Preparation Kit II	96 tests	1.20474.0001			
Detection		foodproof® Listeria Genus Detection Kit,	96 tests	1.20451.0001			
		Hybradization Probes (for LC 1.x, 2.0)					
		foodproof [®] <i>Listeria</i> Genus Detection Kit, 5' Nuclease	96 tests	1.20457.0001			
	AOAC-RI 070401	foodproof® Listeria monocytogenes	96 tests	1.20452.0001			AOAC-RI
	NordVal 025	Detection Kit, Hybridization Probes					NordVal
		(for LC 1.x, 2.0)					
	AOAC-RI 070401	foodproof [®] Listeria monocytogenes	96 tests	1.20458.0001			AOAC-RI
	NordVal 025	Detection Kit, 5' Nuclease					NordVal
		Singlepath® L'mono	25 tests	1.04148.0001			
		Singlepath [®] Listeria	25 tests	1.04142.0001			
Isolation/	ISO 11290-1	Chromocult® Listeria selective agar base	500 g	1.00427.0500			
confirmation	BAM Ch. 10	Chromocult [®] <i>Listeria</i> agar	10 vials	1.00432.0010			
		Selective Supplement					
		Chromocult [®] Listeria agar	10 vials	1.00439.0010			
		Enrichment Supplement					
		Oxford Selective Listeria Agar	500 g	1.07004.0500			
		Oxford Listeria Selective Supplement	10 vials	1.07006.0010			
		Palcam Listeria Selective Agar Base	500 g	1.11755.0500			
		Palcam Listeria Selective Supplement	10 vials	1.12122.0010			

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,	MOPS-bLEB, 35±2°C, 22±2 h or
		20 h (44 h)	Fraser Broth, 35±2°C, 24 h (48 h)
Plating	ALOA agar + additional, 24 ± 3 h/	Oxford, Palcam, Chromocult®	MOX-agar, 35±2°C, 24±2 h
	(48±3 h)	<i>Listeria</i> , 35°C, 24–48 h	

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Norovirus

Noroviruses are RNA viruses of the family *Caliciviridae*. They are probably the cause of most nonbacterial epidemic outbreaks of gastroenteritis around the world and may account for up to 50% of all foodborne outbreaks of gastroenteritis in the Western world. *Norovirus* affects people of all ages. The virus is transmitted by fecally contaminated food or water, by person-to-person contact, and via aerosolization of the virus and subsequent contamination of surfaces. The infective dose may be as low as 10–100 virus particles, and the virus is very stable in the environment.

Food types most frequently associated with *Norovirus* outbreaks are shellfish, salad ingredients and soft fruits (e.g. frozen berries). A recent study found that 76% of British-grown oysters were contaminated with *Norovirus*. Other than shellfish, most foods become contaminated by food handlers.

Classical *Norovirus* detection methods like electron microscopy or ELISA are not suitable for testing of food matrices and contaminated surfaces. Due to the low infective dose, a detection limit below 1,000 virus particles is required, which neither of these methods can provide. Real-time PCR with the MMB *Norovirus* Kit allows rapid and highly sensitive detection of even small amounts of virus RNA. Depending on the food matrix, RNA preparation and RNA content, the limit of detection is fewer than 50 RNA copies.

Norovirus infection

Norovirus infection causes acute gastroenteritis (inflammation of the stomach and intestines), which commonly involves symptoms such as nausea, diarrhea, projectile vomiting, and abdominal pain. Infections are usually self-limiting and last 24–48 hours. However, dehydration can be a problem among some individuals, especially the very young, the elderly, and people with other illnesses. Outbreaks of *Norovirus* infection often occur in closed or semi-closed communities, such as long-term care facilities, overnight camps, hospitals, prisons, dormitories, and cruise ships, where the infection spreads very rapidly either by person-to-person transmission or through contaminated food.

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Procedure step	Reference	Product description	Pack size	Ord. No.	he	6	Approvals
Sample preparation		MMB DNA/RNA Virus Prep Kit	100 tests	1.44025.0100			
Detection		MMB Norovirus (LC) Kit	100 tests	1.44031.0100			
		MMB Norovirus (R) Kit	100 tests	1.44032.0100			
		MMB Norovirus (V) Kit	100 tests	1.44033.0100			

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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 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. Depending on sample throughput and the requirements for specificity, the choice may be either a DNA-based PCR method (typically for high-throughput laboratories) or immunological-based Lateral Flow Tests (for fewer samples).

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 impaired immune systems are more likely to have a severe illness.

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Procedure step	Reference	Product description	Pack size	Ord. No.	Ac Ac	6	Approvals
Pre-enrichment	¹ ISO 6579	^{1,2,3} BPW	500 g	1.07228.0500			AOAC-RI
	² BAM Ch. 5	² Lactose Broth	500 g	1.07661.0500			AOAC-RI
	³ MLG 4.05	² TSB	500 g	1.05459.0500			
Selective/secondary	¹ ISO 6579	¹ MSRV Medium Base	500 g	1.09878.0500	-		
enrichment	² BAM Ch. 5	¹ MSRV Selective Supplement	10 vials	1.09874.0010			
	³ MLG 4.05	^{1,2,3} RVS	500 g	1.07700.0500			AOAC-RI
		¹ MKTTn	500 g	1.05878.0500			
		^{1,2,3} lodine	100 g	1.04761.0100			
		^{1,2,3} Potassium lodide	250 g	1.05043.0250			
		^{2,3} Tetrathionate Broth Base	500 g	1.05285.0500			
		^{2,3} Brilliant Green	50 g	1.01310.0050			
		² Selenite Cystine Broth	500 g	1.07709.0500			
Sample preparation	AOAC-RI 120301	foodproof [®] ShortPrep I Kit	96 tests	1.20470.0001			AOAC-RI
	NordVal 023						NordVal
	AOAC-RI 120301	foodproof [®] StarPrep One Kit	96 tests	1.20476.0001			AOAC-RI
		foodproof $\ensuremath{^{(\!R\!)}}$ Sample Preparation Kit I	96 tests	1.20473.0001			
		foodproof [®] Magnetic Preparation	480 tests	1.20488.0001			
		Kit I					
		Reagent P	550 tests	1.20494.0001			
Detection	AOAC-RI 120301	foodproof [®] Salmonella Detection	96 tests	1.20453.0001			AOAC-RI
	NordVal 023	Kit, Hybridization Probes					NordVal
		(for LC 1.x, 2.0)			_		
	AOAC-RI 120301	foodproof® Salmonella Detection	96 tests	1.20459.0001			AOAC-RI
	NordVal 023	Kit, 5' Nuclease					NordVal
		foodproof [®] Salmonella Detection	480 tests	1.20459.0004			AOAC-RI
		Kit, 5' Nuclease			_		NordVal
	AOAC-RI 060401	Singlepath® Salmonella	25 tests	1.04140.0001	_		AOAC-RI
Isolation/confirmation	¹ ISO 6579	^{1,2} XLD Agar	500 g	1.05287.0500			
	² BAM Ch. 5	^{1,3} XLT4 Agar (Base)	500 g	1.13919.0500			
	³ MLG 4.05	^{1,3} XLT4 Agar Supplement	100 ml	1.08981.0100			
		¹ Rambach Agar	4 x 250 ml	1.07500.0001			
		^{1,2} Bismuth-Sulfite Agar	500 g	1.05418.0500			
		^{1,2} Hektoen Enteric Agar	500 g	1.11681.0500			

1.2.3 Product description refers to reference method.

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-	BPW, 35°C; 21±3 h
		enrichment Broth / BPW /, 35°C;	
		24 <u>+</u> 2 h	
Selective enrichment	MKTTBn, 37±1°C; 24±3 h and	Tetrethionate Broth 43±0.2°C or	RVS 42±0.5°C; 22±2 h and
	RVS, 41.5±1°C; 24±3 h or	35±2.0°C; 24±2 h and RVS,	Tetrathionate Broth, 42±0.5°C;
	MSRV 41.5±1°C, 24±3 h (48±3 h)	42±0.2°C; 24±2 h or Selenite Cystine	20–24 h
		Broth, 35°C, 24 <u>+</u> 2 h	
Plating	XLD agar + additional, $37^{\circ}C$; 24 ± 3 h	BS agar, XLD agar and Hektoen	BGS agar + XLT4-agar or DMLIA agar,
	(48±3 h)	Enteric agar, 35°C; 24 <u>+</u> 2 h	35±2°C; 21±3 h

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Shigella

The genus *Shigella* consists of four species: *S. dysenteriae*, *S. flexneri*, *S. boydii*, and *S. sonnei*. These Gram-negative, non-motile and non-sporulating bacilli belong to the *Enterobacteriaceae* family. Genetically, they are extremely closely related to *E. coli*.

Shigella spp. are predominantly connected to humans and are rarely isolated from other animals, with the exception of primates. Typical vehicles of foodborne *Shigella* are salads (potato, tuna, shrimp, macaroni, and chicken), raw vegetables, milk and dairy products, as well as poultry. Faecally contaminated water and unsanitary treatment by food handlers are the most common causes of infection.

Shigellosis

The typical symptoms of *Shigella* infection (shigellosis) are abdominal pain, cramps, (bloody) diarrhea, fever and vomiting. Onset time from ingestion is typically 12–50 hours. The infective dose may be as few as 10 cells, depending on age and condition of the host. The disease is caused when virulent *Shigella* organisms attach to, and penetrate, epithelial cells of the intestinal mucosa. After invasion, they multiply and spread to adjacent cells resulting in tissue destruction. Some strains produce enterotoxin and Shiga toxin (verotoxin of *E. coli* 0157:H7). Although most patients recover within 5–7 days, fatality may be as high as 10–15% with some strains. Associated complications include reactive arthritis and hemolytic-uremic syndrome.

Ordering information						ral Fig.	Mo
Procedure step	Reference	Product description	Pack size	Ord. No.	Acal	lat.	Approvals
Enrichment	BAM Ch. 6 (for	TSB	500 g	1.05459.0500			
	DNA hybridization)	Yeast Extract	500 g	1.03753.0500			
Sample preparation		foodproof [®] StarPrep One Kit	100 tests	1.20476.0001			
		foodproof [®] ShortPrep I Kit	96 tests	1.20470.0001			
		foodproof [®] Sample Preparation Kit I	96 tests	1.20473.0001			
		foodproof [®] Magnetic Preparation	480 tests	1.20488.0001			
		Kit I					
		Reagent P	550 tests	1.20494.0001			
Detection		foodproof [®] E. coli and Shigella	96 tests	1.20478.0001			
		Detection Kit – Hybridization probes					
Isolation/confirmation	¹ ISO 21567	^{1,2} MacConkey Agar	500 g	1.05465.0500			
	² BAM Ch. 6	¹ XLD Agar	500 g	1.05287.0500			
		¹ Hektoen Enteric Agar	500 g	1.11681.0500			
		Anaerocult [®] A	10 pcs	1.13829.0001			
		Anaerocult [®] A mini	25 pcs	1.01611.0001			

Reference method

Procedure step	ISO 21567	FDA BAM Chapter 6	FDA BAM Chapter 6 – DNA Hybridization
Enrichment (MPN)	Shigella Broth w. Novobiocin	Shigella Broth w. Novobiocin	Tryptic Soy Broth with Yeast Extract,
	(0.5 ppm), 41.5±1°C, 18±2 h,	(3 ppm): 42°C (0.5 ppm Novobiocin;	36±1°C, 22±2 h
	anaerobic	44°C for S. sonnei), 20 h, anaerobic	
Isolation (MPN) and/or	MacConkey Agar	MacConkey Agar, 35°C, 20 h	
direct plate count	XLD Agar		
	Hektoen Enteric Agar		
	37±1°C, 2±2 h		

MPN = most probable number

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 inform	nation				³⁴ , 11 ₁₀₀	repert	ng.
Procedure step	Reference	Product description	Pack size	Ord. No.	Å	62	Approvals
Enrichment	ISO 6888 (MPN)	Giolitti-Cantoni Broth	500 g	1.10675.0500			
		Potassium tellurite trihydrate	100 g	1.05164.0100			
		Paraffin, viscous	1 liter	1.07160.1000			
	BAM Ch. 12	TSB	500 g	1.05459.0500			
		Sodium Chloride	1 kg	1.06400.1000			
		Sodium Pyruvate	50 g	1.06619.0050			
		BPW	500 g	1.07228.0500			
		Thioglycollate Broth	500 g	1.08190.0500			
Sample preparation		MMB Bacteria Prep Kit	100 tests	1.44030.0100			
Detection		MMB Staphylococcus aureus (V) Kit	100 tests	1.44048.0100			
		MMB Staphylococcus aureus (R) Kit	100 tests	1.44307.0100			
		MMB Staphylococcus aureus (LC) Kit	100 tests	1.44308.0100			
Isolation/confirmation	ISO 6888	Baird-Parker Agar (Base)	500 g	1.05406.0500			
	BAM Ch. 12	Egg Yolk-Tellurite Emulsion	10 x 50 ml	1.03785.0001			
		Brain Heart Broth	500 g	1.10493.0500			
		Bactident [®] Coagulase	6 vials	1.13306.0001			

Reference method

Procedure step	ISO 6888	FDA BAM Chapter 12
Enrichment (MPN)	Modified Giolitti and Cantoni Broth,	TSB + 10% NaCl + 1% Sodium Pyruvate
	37±1°C, 24 (48) ±2 h	
Isolation (MPN) and/	Baird-Parker Agar or Rabbit Plasma	Baird-Parker Agar
or direct plate count	Fibrinogen Agar, 37±1°C, 24 (48) ±2 h	
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* 01 or 0139. 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.

The MMB Vibrio cholerae Kit is for the analysis of foods and water samples. Not intended for in vitro diagnostic purposes.

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.

					20		
Procedure step	Reference	Product description	Pack size	Ord. No.	Re	¢?	Approvals
Enrichment	ISO 21872	Alkaline Peptone Water	500 g	1.01800.0500			
	BAM Ch. 9						
Sample preparation		MMB Bacteria Prep Kit	100 tests	1.44030.0100			
Detection		MMB Vibrio cholerae (V) Kit	100 tests	1.44038.0100			
		MMB Vibrio cholerae (R) Kit	100 tests	1.44309.0100			
		MMB Vibrio cholerae (LC) Kit	100 tests	1.44310.0100			
Isolation/confirmation	ISO 21872	TCBS Agar	500 g	1.10263.0500			
	BAM Ch. 9						

Reference method

Procedure step	ISO 21872	FDA BAM Chapter 9
1st selective	Alkaline Saline Peptone Water 37±1°C or	Alkaline Peptone Water 35±2°C;
enrichment	$41.5\pm1^{\circ}C$ (fresh products); 6 ± 0.5 h	7 \pm 1 h (18–21 h for processed foods) /
		42±0.2°C; 18-21 h for raw oysters
2nd selective	Alkaline Saline Peptone Water	N/A
enrichment	41.5±1°C; 18±1 h	
Plating	TCBS Agar, 37±1°C; 21±3 h	TCBS Agar, 35±2°C; 21±3 h
	additional medium of choice	



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Beverage spoilage Bacteria and yeasts

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Beer spoilage bacteria

Beer contamination can be recognized by unwanted turbidity due to microorganisms or protein flocculation, pH changes, and undesired changes in flavor. Often, the presence of beer spoilage bacteria results in the loss of whole batches of beer.

Traditional screening methods for beer spoilage organisms typically involve membrane filtration of a volume of beer, possibly followed by enrichment in a liquid broth prior to plating on solid media for identification. The complete procedure may take in excess of 5 days for detection and up to 3 weeks for identification of suspect colonies.

In comparison, the foodproof[®] Beer Screening Kit detects the presence of 30 species and subspecies of the most troublesome spoilage bacteria in a single assay, which can be performed on a one-to-two-day enrichment culture (e.g. in MRS Broth). Furthermore, melting curve analysis enables the identification of the most important beer spoilage bacteria.

Note: Melting curve analysis is applicable to hybridization probes only. Therefore the kit is not available in 5' Nuclease format.

The kit allows detection of the 30 most relevant beer spoilage bacteria of the genera *Lactobacillus*, *Pediococcus*, *Pectinatus* and *Megasphaera*, as well as identification of the species *Lactobacillus brevis*, *Lactobacillus lindneri*, *Pediococcus damnosus*, *Pediococcus inopinatus* and *Megasphaera cerevisiae*.



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Beer spoilage – Saccharomyces cerevisiae var. diastaticus

Saccharomyces cerevisiae var. diastaticus (or just Saccharomyces diastaticus), is a so-called "wild yeast". It is very closely related to normal brewer's yeast Saccharomyces carlsbergensis, making it very difficult to control in the brewing process. Due to its ability to ferment dextrins, which are not utilized by normal brewer's yeast, Saccharomyces diastaticus is one of the major contaminants in packaged beer. Spoilage with this yeast results in the development of turbidity as well as phenolic off-flavors and odors. However, the biggest problem arises when pitching yeast becomes contaminated, as this is virtually impossible to detect by traditional methods.

The foodproof[®] Saccharomyces cerevisia var. diastaticus Detection Kit is intended for detection of the wild yeast (spoilage yeast) Saccharomyces diastaticus in pitching yeast and in enrichment cultures of beer (2 days in YM Broth).





Beverage spoilage – Dekkera (Brettanomyces)

Dekkera is the teleomorph of the genus Brettanomyces and an ascospore-forming yeast genus that currently comprises 4 species. The species Dekkera anomala and Dekkera bruxellensis are the most important in terms of spoilage of various kinds of alcoholic and non-alcoholic beverages (e.g. beer, wine, soft drinks and carbonated beverages). Dekkera spoilage is characterized by dense cloudiness, thick sediments and surface films, as well as phenolic off-flavors (known in wine as "Brett").

Conventional microbiological methods for the detection and identification of Dekkera are very timeconsuming, taking 1 to 2 weeks to perform. In contrast, the foodproof® Dekkera Quantification Kit is based on real-time PCR technology and is recognized as a rapid, highly sensitive and specific detection method. The kit can be used for presence/absence testing of Dekkera after 48-hour enrichment in YM Broth, or for direct quantitative determination of Dekkera down to 100 cells/ml.

Ordering inform	mation				al-lime	eral Fig	3
Procedure step	Reference	Product description	Pack size	Ord. No.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	10	Approvals
Sample preparation		foodproof [®] StarPrep Four Kit	96 tests	1.20479.0001			
Detection		foodproof® Dekkera Quantification	96 tests	1.20477.0001			
		Kit, 5' Nuclease					



Juice spoilage – Alicyclobacillus

The genus *Alicyclobacillus* consists of Gram-positive, acidophilic and thermophilic, spore-forming bacteria typically found in soil. *Alicyclobacillus* spores, often brought into food manufacturing facilities on contaminated fruit, are able to survive typical pasteurization procedures. The non-pathogenic bacteria can cause disinfectant-like off-flavors in the final product, especially affecting fruit juices, concentrates, and preparations as well as tomato products. Most spoilage-related studies concerning *Alicyclobacillus* focus on the species *A. acidoterrestris*. Since conventional microbiological methods for the detection and identification of *Alicyclobacillus* are very time-consuming, polymerase chain reaction (PCR) has been introduced to the beverage industry as a highly sensitive and specific detection method.

Spoilage of shelf stable fruit juice products by *Alicyclobacillus* bacteria can be very costly to the fruit juice industry. The spores, often present in fruit concentrates, are heat resistant and can survive heat processes used by juice manufacturers. It is therefore important that concentrates and other raw materials are screened for spores of these taint producers to reduce the risk of spoilage of processed products.

The foodproof[®] *Alicyclobacillus* Detection Kit is intended for the detection of the *Alicyclobacillus* genus and the identification of *A. acidoterrestris* in enrichment cultures of fruit concentrate, juices and soft drinks. Sample enrichment/pre-incubation can be performed in accordance with IFU Method 12, but testing can be carried out after just 2 days of incubation.





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Procedure step	Reference	Product description	Pack size	Ord. No.	Åe	\$	Approvals
Sample preparation		foodproof® ShortPrep II Kit	96 tests	1.20471.0001			
		foodproof® Sample Preparation Kit II	96 tests	1.20474.0001			
Detection		foodproof® Alicyclobacillus	96 tests	1.20493.0001			
		Detection Kit, 5' Nuclease					

Reference method

Procedure step	IFU Method 12 – raw materials / concentrates	IFU Method 12 – post-processing samples and packaged products
Dilution	YSG Broth or BAT Broth / sterile demineralized	
	water (concentrates only)	
Heat shock	80°C, 10 minutes	
(unheated products)		
Filtration (for filterable samples)	0.45 μm filter or enrichment	
Incubation (for non-filterable samples)	2–5 days, 45±1°C	7 days, 45±1°C
Isolation	K-agar and	K-agar and
	BAT agar or YSG agar, 45°C 2–5 days	BAT agar or YSG agar, 45°C 2–5 days



GMO Genetically Modified Organisms



GMO screening: state-of-the-art multiplex assay

In order to improve product quality, agronomic traits, and develop resistance to pests, genetic modification of agriculture crops has become a predominant activity of research departments in the agricultural industry. Due to the ongoing debate surrounding food containing genetically modified organisms (GMOs) and consumer requests for unambiguous labeling of genetically modified foods, various countries have established, or are currently in the process of establishing, regulatory frameworks dedicated to GMOs. In order to enforce such regulations, reliable methods for GMO screening in food products are required.

As a general screening method, foodproof[®] Real-Time PCR Kits allow users to monitor the presence of all commonly used control sequences in genetically modified plants: 35S, NOS, FMV and the bar gene.

The foodproof[®] GMO Screening Kit Hybridization Probes simultaneously detects the two primary control sequences (35S and NOS) in genetically modified plants from preparations of raw materials and food samples. In addition to these 2 sequences, the foodproof[®] GMO Screening Kit 5' Nuclease, detects the bar gene and FMV in genetically modified plants. This allows detection of any of the four inserted primary control sequences or genes in genetically modified plants from preparations of raw materials and processed food as well as feed and seed samples.

A positive test result for the presence of such "marker sequences" requires quantification of the relative GMO content of specific crops. In the EU, the content of GMO crops must be labeled on food products except in cases of accidental and unavoidable contamination at relative levels below 0.9%. It is therefore necessary to perform quantitative testing on certain products to evaluate the presence of specific markers for the approved GMOs.

For ordering information see page 57.

GMO maize quantification – single event or multiplex

The foodproof[®] GMO Maize Quantification Kit Hybridization Probes is designed for the quantitative detection of genetically modified Bt-176 maize. The genetically modified maize "Event 176" or "Maximizer", better known as Bt-176 maize, was the first GMO maize approved in the EU. Bt-176 maize carries a gene that codes for the Cry1A(b) toxin, derived from the bacterium *Bacillus thuringiensis*, which confers resistance to the European corn borer. This plant pest leads to yield losses and high costs for crop protection. Additionally, Bt-176 maize is herbicide-tolerant to glufosinate ammonium, and carries a marker gene expressing resistance to the antibiotic ampicillin.

The foodproof[®] 35S Maize Quantification Kit enables relative quantification of GMO DNA in a multiplex covering 19 different events containing the 35S promoter sequence, including Maximizer[®], StarLink[®], SeedLink[®], Mon and Roundup Ready[®] in one PCR test. Compared to standard test systems, this offers a key advantage in time-to-result by state-of-the-art multiplexing.

GMO soya quantification

The foodproof[®] GMO Soya Quantification Kit is the optimal solution for quantitative detection of genetically modified Roundup Ready[®] soya. The genetically modified soybean "GTS40-3-2", better known as Roundup Ready[®] soya, was the first GMO crop approved in the EU. Roundup Ready soya carries a gene that codes for the enzyme CP4 EPSPS (5-enolpyrovylshikimate-3-phosphate synthase from *Agrobacterium* sp. strain CP4), which confers tolerance to herbicides with the active ingredient glyphosate (e.g. Roundup).

Soya has become one of the most important crop plants worldwide and is mainly used for the production of oils and animal feed. In the USA (one of the world's leading soya-producing countries), the cultivation of genetically modified soya plants is widespread and now accounts for about 90% of the planted area.

Ordering inf	ormation				cal-lime	^{ateral Flo.}	no
Procedure step	Reference	Product description	Pack size	Ord. No.	\$	~	Approvals
Sample preparation	on	foodproof® GMO Sample Preparation Kit	50 tests	1.20475.0001			
Detection		foodproof [®] GMO Screening Kit, 5' Nuclease	128 reactions	1.20490.0001			
		foodproof® GMO Screening Kit, Hybridization	128 reactions	1.20449.0001			
		Probes					
		foodproof [®] GMO Soya Quantification Kit,	128 reactions	1.20491.0001			
		5' Nuclease					
		foodproof [®] GMO Soya Quantification Kit,	128 reactions	1.20450.0001			
		Hybridization Probes					
		foodproof [®] GMO 35S Maize Quantification	128 reactions	1.20492.0001			
		Kit, 5' Nuclease					
		foodproof [®] GMO Maize Quantification Kit,	128 reactions	1.20448.0001			
		Hybridization Probes					

Real-time PCR sample preparation

				Orgar	nism								
		Campus	E. coli	E. Sake	Listeri.	Norou:	Salmo	S. aureus L. Ducus, V. Choler Derringous, Ober	Shigen B. Cere	Spollas US	Veast Organisms	chio _	defection
Product	Ord. No.												Validated
foodproof [®] ShortPrep I Kit	1.20470.0001												AOAC-RI, NordVal
foodproof®	1.20471.0001												AOAC-RI, NordVal
ShortPrep II Kit													
foodproof®	1.20472.0001												
ShortPrep III Kit													
foodproof [®] StarPrep	1.20476.0001												AOAC-RI,
One Kit, 100 isolations													MicroVal, NordVal
foodproof [®] StarPrep	1.20476.0004												AOAC-RI,
One Kit, 500 isolations													MicroVal, NordVal
foodproof®	1.20479.0001												
StarPrep Four Kit													
foodproof [®] Sample	1.20473.0001												
Preparation Kit I													
foodproof [®] Sample	1.20474.0001												
Preparation Kit II													
foodproof [®] Magnetic	1.20488.0001												
Preparation Kit I													
Reagent P for foodproof® Magnetic Preparation Kit I	1.20494.0001		1										
foodproof [®] GMO	1.20475.0001												
Sample Preparation Kit													
MMB Bacteria Prep Kit	1.44030.0100												
MMB DNA/RNA	1.44025.0100												
Virus Prep Kit													

Real-time PCR detection of pathogens

		^{light}	'ights	'ights	Sion 480	Police Bioystems Spendo Bioystems Microt Stress Marthes	WCorbert		
Product	Ord. No.						Validated		
foodproof [®] Brucella Detection Kit, 5' Nuclease	1.20454.0001								
foodproof [®] Campylobacter Detection Kit, 5' Nuclease	1.20460.0001								
foodproof [®] Campylobacter Detection Kit, Hybridization Probes	1.20468.0001								
foodproof [®] <i>E. coli</i> and <i>Shigella</i> Detection Kit,	1.20478.0001								
Hybridization Probes									
foodproof [®] E. coli 0157 Detection Kit, 5' Nuclease	1.20455.0001						AOAC-RI		
foodproof [®] E. coli 0157 Detection Kit, Hybridization Probes	1.20446.0001						AOAC-RI, NordVal		
foodproof [®] Enterobacter sakazakii Detection Kit,	1.20466.0001								
Hybridization Probes									
foodproof [®] Enterobacteriaceae plus E. sakazaki	1.20456.0001						MicroVal		
Detection Kit, 5' Nuclease									
foodproof® Enterobacteriaceae plus E. sakazaki	1.20489.0001						MicroVal		
Detection Kit, Hybridization Probes									
foodproof [®] Listeria Genus Detection Kit, 5' Nuclease	1.20457.0001								
foodproof [®] Listeria Genus Detection Kit, Hybridization Probes	1.20451.0001								
foodproof [®] Listeria monocytogenes Detection Kit, 5' Nuclease	1.20458.0001						AOAC-RI, NordVal		
foodproof [®] Listeria monocytogenes Detection Kit,	1.20452.0001						AOAC-RI, NordVal		
Hybridization Probes							·		
foodproof [®] Salmonella Detection Kit, 5' Nuclease	1.20459.0001						AOAC-RI, NordVal		
foodproof [®] Salmonella Detection Kit, 5' Nuclease, 480 react.	1.20459.0004						AOAC-RI, NordVal		
foodproof [®] Salmonella Detection Kit, Hybridization Probes	1.20453.0001						AOAC-RI, NordVal		
MMB Bacillus cereus (LC) Kit	1.44316.0100								
MMB Bacillus cereus (R) Kit	1.44315.0100								
MMB Bacillus cereus (V) Kit	1.44035.0100								
MMB Clostridium perfringens (LC) Kit	1.44314.0100								
MMB Clostridium perfringens (R) Kit	1.44313.0100								
MMB Clostridium perfringens (V) Kit	1.44036.0100								
MMB Legionella pneumophila (LC) Kit	1.44312.0100								
MMB Legionella pneumophila (R) Kit	1.44311.0100								
MMB Legionella pneumophila (V) Kit	1.44037.0100								
MMB Legionella Screening (LC) Kit	1.44318.0100								
MMB Legionella Screening (R) Kit	1.44317.0100								
MMB Legionella Screening (V) Kit	1.44034.0100								
MMB Norovirus (LC) Kit	1.44031.0100								
MMB Norovirus (R) Kit	1.44032.0100								
MMB Norovirus (V) Kit	1.44033.0100								
MMB Staphylococcus aureus (LC) Kit	1.44308.0100								
MMB Staphylococcus aureus (R) Kit	1.44307.0100								
MMB Staphylococcus aureus (V) Kit	1.44048.0100								
MMB Vibrio cholerae (LC) Kit	1.44310.0100								
MMB Vibrio cholerae (R) Kit	1.44309.0100								
MMB Vibrio cholerae (V) Kit	1.44038.0100								

 \rightarrow For further products please open

Real-time PCR detection of spoilage organisms and GMO screening/quantification

Spoilage organisms Validated Product Ord. No. foodproof® Alicyclobacillus Detection Kit, 1.20493.0001 5' Nuclease Image: Control of the second se				Real-	time t	hermal cycler		
ProductOrd. No.foodproof® Alicyclobacillus Detection Kit,1.20493.00015' NucleaseIfoodproof® Beer Screening Kit,1.20469.0001Hybridization ProbesIfoodproof® Dekkera Quantification Kit,1.20477.00015' NucleaseIfoodproof® Saccharomyces cerevisiae var. diastaticus1.20467.0001IIDetection Kit, Hybridization ProbesII<	Spoilage organisms		l'ghte.	lighter 1.x	lights	Biohand 480	Applied BioyStems Spendor Signstems Otherit Stra.	-CWC organ
foodproof® Alicyclobacillus Detection Kit, 1.20493.0001 Image: Constraint of the section Kit, Image: Constraint of	Product	Ord. No.						Validated
5' Nuclease Image: Sevening Kit, 1.20469.0001 Image: Sevening Kit, 1.20469.0001 Image: Sevening Kit, 1.20470.0001 Image: Sevening Kit, 1.20470	foodproof® Alicyclobacillus Detection Kit,	1.20493.0001						
foodproof® Beer Screening Kit,1.20469.0001Image: Constraint of the sector of the	5' Nuclease							
Hybridization Probes Image: Constraint of the symptotic of the symptot of the sy	foodproof® Beer Screening Kit,	1.20469.0001						
foodproof® Dekkera Quantification Kit, 1.20477.0001 Image: Constraint of the second seco	Hybridization Probes							
5' Nuclease foodproof® <i>Saccharomyces cerevisiae var. diastaticus</i> 1.20467.0001 ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	foodproof [®] Dekkera Quantification Kit,	1.20477.0001					-	
foodproof® Saccharomyces cerevisiae var. diastaticus 1.20467.0001	5' Nuclease							
Detection Kit, Hybridization Probes	foodproof® Saccharomyces cerevisiae var. diastaticus	1.20467.0001						
	Detection Kit, Hybridization Probes							

Real-time thermal cycler

GMO		ghto.	ighton, "cle	ighter Vole	iop _{act}	oplied Bi	
Product	Ord. No.	\sim	~~ (~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Validated
foodproof® GMO Screening Kit,	1.20490.0001						
5' Nuclease							
foodproof® GMO Screening Kit,	1.20449.0001						
Hybridization Probes							
foodproof® GMO Screening Kit,	1.20462.0001						
Hybridization Probes (LC 480)							
foodproof® GMO Maize Quantification Kit,	1.20492.0001						
5' Nuclease							
foodproof® GMO Maize Quantification Kit,	1.20448.0001						
Hybridization Probe							
foodproof® GMO Soya Quantification Kit,	1.20491.0001						
5' Nuclease							
foodproof® GMO Soya Quantification Kit,	1.20450.0001						
Hybridization Probes							

Lateral Flow Tests for pathogen detection

For more information on our broad food testing portfolio:

www.merckmillipore.com/foodsafety

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