

MBPCR238

Hi-PCR® Generic E. coli Probe PCR Kit

Description

Escherichia coli is a Gram negative, facultative anaerobic rod-shaped bacterium of the genus *Escherichia* that are normal inhabitants of the human gastrointestinal tract but are not harmful for the host animal. They are classified into 150 to 200 serotypes based on somatic (O), capsular (K), fimbrial (F) and flagellar (H) antigens. Only a small proportion of strains are pathogenic, producing virulence factors permitting them to cause disease. *E. coli* are among the most frequent bacterial causes of diarrhea and are classified by clinical syndrome they produce into enterotoxigenic *E. coli* (ETEC), enteropathogenic *E. coli* (EPEC), enterohemorrhagic *E. coli*, enteroinvasive *E. coli* (EIEC), and enteroaggregative *E. coli* which cause urinary tract infections (UTI), neonatal meningitis and intestinal diseases (gastroenteritis) etc. Nucleic acid amplification-based assays or Polymerase Chain Reaction (PCR) is an alternative method of *E. coli* diagnosis that allows for sensitive and specific detection of *E. coli* DNA from clinical samples. Real-Time PCR technique is considerably simple and fast with respect to the standard PCR technique. This technique has been successfully used for the rapid detection and identification of a variety of infectious pathogens.

NOTE: Hi-PCR® Generic E. coli Probe PCR Kit is for *in-vitro* use only.

Intended Use

Recommended for sensitive and specific detection of Generic *E. coli*.

Principle

Real-time polymerase chain reaction, also called quantitative Polymerase Chain Reaction (qPCR) or kinetic Polymerase Chain Reaction, is a laboratory technique based on the principle of PCR. This technique is used to amplify a targeted DNA sequence by use of hydrolysis probes that are short oligonucleotides that have a fluorescent reporter dye attached to the 5' end and a quencher dye to the 3' end. Hi-PCR® Generic E. coli Probe PCR Kit is designed to detect the ***E. coli* in FAM channel and internal control in JOE channel**. The kit allows sensitive and specific detection of Generic *E. coli* in a single tube reaction.

Positive control

This is a control reaction using a known template (target pathogen). A positive control is usually used to check that the primers have been designed properly and the PCR conditions have been set up correctly.

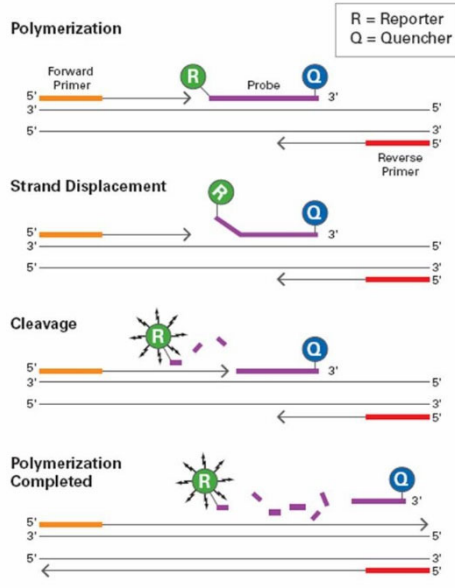
Negative Control

A Negative control is needed to ensure that the reagents, equipment, and environment used in the assay is not contaminated. In this reaction, Nuclease free water is used as the template. It is recommended to have minimum 1 reaction of negative control per run.

Internal Control

This is a control sequence which is amplified in the same reaction tube along with the target sequence (target species) but detected with a different primer (i.e. Multiplex PCR). An internal control is often used to detect the failure of amplification in cases where the target sequence is not amplified.

Diagrammatic representation of preferential binding of probe specific to DNA fragments in Real-time PCR



Polymerization: A fluorescent reporter (R) dye and a quencher (Q) are attached to the 5' and 3' end of the probe respectively

Strand displacement: When the probe is intact, the report dye emission is quenched.

Cleavage: During each extension cycle, the DNA polymerase cleaves the reporter dye from the probe

Polymerization completed: Once separated from the quencher, the reporter dye emits its characteristic fluorescence

While the probe is intact, the proximity of the quencher dye greatly reduces the fluorescence emitted by the reporter dye by fluorescence resonance energy transfer (FRET). The probes are designed such that they anneal within a DNA region amplified by a specific set of primers. During PCR amplification, these probes will hybridize to the target sequences located in the amplicon i.e. the DNA. As the *Taq* DNA polymerase replicates the template with the bound probe, the 5'-nuclease activity of the polymerase enzyme cleaves the fluorescent probe. The end result in cleavage of the probe is separation of the reporter dye from the quencher dye and increasing the reporter dye signal. As the probe is removed from the target strand, primer extension continues to the end of the template strand. Hence, fluorescence detected in the quantitative PCR thermal cycler is directly proportional to the fluorophore released and the amount of DNA template present in the PCR. Thus, inclusion of the probe does not inhibit the overall PCR process.

Features

- Fast and simple
- Good sensitivity and specific results
- Guaranteed reproducible results
- Rapid detection of all relevant clinical pathogens

Sample Source: Bacterial Culture / Water / Blood/ Food samples

Storage and Shelf life

The provided kit has a shelf-life of 12 months when stored at -20°C. Repeated thawing and freezing of PCR reagents should be avoided, as this may reduce the sensitivity. If the reagents are to be used multiple times, we recommend storing reagents as aliquots to avoid repeated freeze and thaw. Degradation of sample RNA specimens can also reduce the sensitivity of the assay. HiMedia Laboratories does not recommend using the kit after the expiry date stated on pack.

Kit Contents: The provided PCR kit contains:

Components	Product code	Reagents provided for (reactions)* (µL)	
		25R	50R
2X Super Master Mix	MBT139	270	540
Generic E. coli Primer-Probe Mix	DS1547	54	108
Generic E. coli Positive Control	DS1548	40	80
Molecular Biology Grade Water for PCR	ML065	200	400

* For a 20 µL PCR reaction

Specimen collection and Handling

Follow appropriate techniques for handling specimens; after use, contaminated materials must be sterilized by autoclaving before discarding. Standard precautions as per established guidelines should be followed while handling clinical specimens and items contaminated with blood and other body fluids. Safety guidelines may be referred in individual safety data sheets.

Sample Preparation

Various samples are routinely examined. For extraction and purification of pure DNA for high yield, perform the nucleic acid purification using HiMedia's extraction kits as instructed in the protocol.

Materials needed but not provided

- PCR tubes (Product code PW1255) or PCR Strips (Product code: PR17) or PCR Plates (Product code: PR2 / PR3 / PR19) & Sealing film (PR18)
- Insta Q Real Time PCR System (Product Code: LA1012 / LA1023 / LA1024 / LA1073 / LA1074)
- Barrier Micropipette Tips
- Micropipettes
- For water samples: HiPurA® Water DNA Purification Kit (with enrichment) (MB547) and HiPurA® Water DNA Purification Kit (without enrichment) (MB577)
- For bacterial cultures: HiPurA® Bacterial Genomic DNA Purification Kit (MB505)
- For clinical samples: HiPurA® Multi-Sample DNA Purification Kit (MB554)
- For Food samples: HiPurA® Food Pathogen (Bacteria) DNA Purification Kit (MB568A) and HiPurA® Food DNA Purification Kit (MB562)

General Preparation Instructions

- Before use all PCR components should be completely thawed on ice (4°C).
- Perform the amplification reactions in a clean area, preferably in a biosafety cabinet.
- Use of aerosol barrier pipette tips is recommended to reduce contamination risks from extraneous DNA templates.
- Extract and store positive control sample (if used) separately from all other reagents to avoid contamination and add it to the reaction mix in a separate area.

A. Protocol for PCR Master Mix Preparation

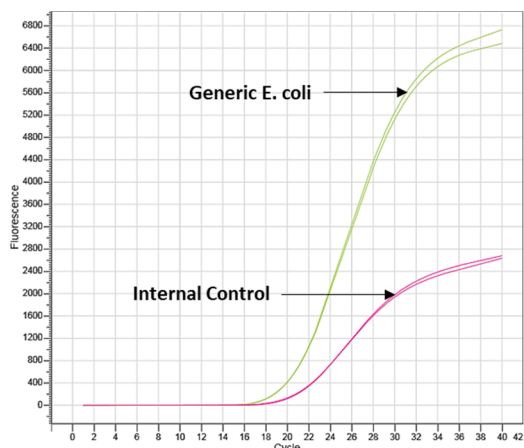
Components	Product code	Volume (µL) to be added for 1R (for a 20 µL reaction)
2X Super Master Mix	MBT139	10 µL
Generic E. coli Primer-Probe Mix	DS1547	2 µL
Template DNA / Positive Control / Negative Control	-	8 µL
Total volume		20 µL

Centrifuge the tube briefly at 6000 rpm for about 10 seconds. Place the tubes in Real-time PCR machine and set the recommended PCR program (mentioned below). Interpret the data from the amplification plot (observe the Ct values).

B. Recommended PCR program

- | | | |
|--------------------------------------|---|---------------------|
| 1. Initial denaturation | : 95°C for 10 minutes | } No. of cycles: 40 |
| 2. Denaturation | : 95°C for 15 seconds | |
| 3. Annealing & Extension
Channels | : 57°C for 20 seconds (Sampling)
: FAM/JOE | |
| 4. Hold | : 4°C for ∞ | |

C. Amplification Data



Sr. No.	Sample	Ct value
1.	Generic E. coli positive control	19.9
2.	Internal Control	22.5

Image representing amplification plot of Generic *E. coli* DNA with Ct values using Hi-PCR® Generic E. coli Probe PCR Kit. The results completely depend upon sample types.

D. Data Analysis

The following conditions should be met for a valid diagnostic test:

Control	Target	
	Generic E. coli (FAM)	Internal Control (JOE)
Positive Control	+	+
Negative Control	-	+

Ct value	Result
≤ 35	Detected (+)
> 35 or N/A	Not detected (-)

E. Data Interpretation

Target		Result Interpretation
Generic E. coli (FAM)	Internal Control (JOE)	
+	+/-*	Positive for Generic E. coli
-	+	Negative for Generic E. coli
-	-	PCR inhibition or reagent failure. Repeat PCR or repeat extraction from original sample

*The presence or absence of a signal in the JOE channel is not relevant for the validity of the test run due to competition between the test template and Internal Control template.

Analytical Performance

Limit of Detection (LoD) - Analytical Sensitivity

The analytical sensitivity was defined as the lowest concentration of the target that could be reliably detected with 95% confidence. The analytical sensitivity for the Hi-PCR® Generic E. coli Probe PCR Kit was conducted using genomic DNA on InstaQ96® Real Time PCR system. The preliminary LoD of each target was determined by testing a 10-fold dilution series in triplicates per concentration, and then confirmed with 20 replicates of the concentration determined to be the detectable LoD. The data revealed that the Hi-PCR® Generic E. coli Probe PCR Kit detects ≈ 8.4 copies/μL. Thus, the detectable Limit of Detection (LoD) was determined to be 8.4 copies/μL.

Inclusivity

In silico analysis for the assessment of inclusivity for the Hi-PCR® Generic E. coli Probe PCR Kit was conducted by mapping the primers and probe against the available Generic E. coli sequences in GenBank. The Hi-PCR® Generic E. coli probe PCR Kit targets 100% of the known Generic E. coli strains.

Cross-reactivity - Analytical Specificity

Wet testing analysis was performed against the pathogens available in the laboratory. In addition, *in silico* analysis was performed using NCBI nucleotide and Primer BLAST. The primers and probe for Generic E. coli were analyzed against the organisms related to Generic E. coli, organisms causing similar symptoms as an infection with Generic E. coli and organisms with similar route of transmission. Below mentioned table represents the list of pathogens analyzed for analytical specificity. No cross-reactivity was observed with any strains mentioned below.

<i>Campylobacter jejuni</i>	<i>Acinetobacter baumannii</i>
<i>Candida albicans</i>	<i>Staphylococcus epidermidis</i>
<i>Escherichia coli O157:H7</i>	<i>Listeria monocytogenes</i>
<i>Streptococcus pneumoniae</i>	<i>Bacillus subtilis</i>
<i>Salmonella typhi</i>	<i>Lactobacillus acidophilus</i>
<i>Shigella flexineri</i>	<i>Enterococcus faecalis</i>
<i>Legionella pneumophila</i>	<i>Aspergillus spp.</i>
<i>Staphylococcus aureus</i>	<i>Vibrio cholerae</i>
<i>Klebsiella pneumoniae</i>	<i>Saccharomyces cerevisiae</i>
<i>Pseudomonas aeruginosa</i>	

Warning

Certified for *in vitro* Diagnostic Use (IVD). Not for Medicinal Use.

Precautions

Read the procedure carefully before beginning the protocol. Wear protective gloves/protective clothing/eye protection/face protection. Follow good clinical laboratory practices while handling clinical samples. Standard precautions should be followed as per established guidelines. Safety guidelines may be referred in safety data sheets of the product.

Limitations

Although rare, mutations within the highly conserved regions of the targets genes covered by the kit's primers and/or probe may result in under quantitation or failure to detect the presence of the target regions in these cases. Validity and performance of the assay design are revised at regular intervals.

Performance and Evaluation

Each lot of Hi-PCR® Generic E. coli Probe PCR Kit is tested against predetermined specifications to ensure consistent product quality.

Quality Control

Each lot of HiMedia's Hi-PCR® Generic E. coli Probe PCR Kit is assayed for contaminating endonuclease, exonuclease and non-specific DNase activities. Functionally tested in DNA amplification.

Troubleshooting Guide

Sr. No.	Problem	Cause	Solution
1.	No amplification	Degraded samples	1. Check the integrity of DNA using agarose gel electrophoresis.
			2. Use freshly prepared DNA to ensure the availability of intact template sequence for efficient amplification.
		Error in protocol setup	Verify that the correct reagent volumes, dilutions and storage conditions have been used.
2.	Variability between replicates	Error in reaction set-up	Prepare a large volume master mix, vortex thoroughly and aliquot into reaction tubes.
		Air bubbles in reaction mix	Briefly centrifuge reaction samples/plate prior to running on a real-time PCR instrument.
		Pipetting error	C _t values of replicates can show increased variation due to poor laboratory technique or imprecise pipettes.
3.	Amplification in negative control	Reagents contaminated	1. Replace all critical solutions. 2. Repeat the analysis of all tests with fresh aliquots of critical reagents.
4.	No signal with positive controls	Incorrect programming of the temperature profile of the thermocycler	Compare the temperature profile to the manual.

Safety Information

Hi-PCR® Generic E. coli Probe PCR Kit is for laboratory use only, not for drug, household or other uses. Take appropriate laboratory safety measures and wear gloves when handling.

Disposal

User must ensure safe disposal by autoclaving and/or incineration of used or unusable preparations of this product. Follow established laboratory procedures in disposing of infectious materials and material that comes into contact with clinical sample must be decontaminated and disposed of in accordance with current laboratory techniques.

Technical Assistance

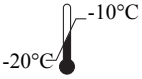
At HiMedia, we pride ourselves on the quality and availability of our technical support. For any kind of technical assistance, mail at mb@himedialabs.com.



In vitro diagnostic medical device



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Storage temperature



Do not use if package is damaged



HiMedia Laboratories Private Limited,
Reg. Off: Plot No. C-40, Road No. 21Y,
MIDC, Wagle Industrial Estate, Thane,
(West) 400604, Maharashtra, INDIA. Web:
www.himedialabs.com



CE Partner 4U ,Esdoornlaan 13, 3951 DB
Maarn The Netherlands,
www.cepartner4u.eu



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HiMedia Laboratories Pvt. Ltd. Reg.office : Plot No. C-40, Road No. 21Y, MIDC, Wagle Industrial Estate, Thane, (West) 400604, Maharashtra, INDIA. Customer Care No.: 00-91-22-6116 9797 Tel: 00-91-22-6147 1919, 6903 4800 Email: techhelp@himedialabs.com Website: www.himedialabs.com