



foodproof® SL *Bacillus cereus* Detection Kit

Revision A, March 2024

PCR kit for the qualitative detection of *Bacillus cereus* DNA using real-time PCR instruments.

Product No. KIT230201

Kit for 50 reactions for a maximum of 48 samples

Store the kit at -15 to -25 °C

For food testing purposes.

FOR *IN VITRO* USE ONLY



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1. Introduction

Bacillus cereus is increasingly recognized as the causal agent of gastrointestinal and non-gastrointestinal diseases. Two clinical diseases connected to food poisoning can be distinguished: diarrhea and emesis. Heat-labile enterotoxins cause diarrhea, while a heat-stable depsipeptide toxin, cereulide, provokes emesis. In general, both types of foodborne disease are relatively mild and self-limiting. Nevertheless, during the last years, severe forms caused by emetic *B. cereus* have occasionally been reported, involving hospitalization and even deaths. Due to the increasing number of reports, especially of severe cases, fast detection methods are required for diagnostic purposes as well as for prevention of food contamination and foodborne outbreaks. It is known that ingestion of more than 10^5 CFU of *B. cereus* per gram of food may cause food poisoning.

2. Intended Use

The foodproof SL *Bacillus cereus* Detection Kit is designed to detect the specific sequence of the *groEL* gene for *Bacillus cereus* in various food sources, clinical material and environmental samples. This kit provides Real-time PCR MasterMix with enzyme components and a specific primer/probe set for rapid testing by real-time PCR assay, as well as the Internal Control (IC) system for the reliable results.

3. Principle of PCR detection

The foodproof SL *Bacillus cereus* detection assay is a qualitative, duplex real-time PCR test for the detection of the pathogen-specific gene (*groEL*) and Internal Control (IC) using specific primers and probes labeled with fluorescent dyes. The target sequences are detected through the FAM and HEX (VIC) channels, respectively.

The primer and probe mixture provided exploits the so-called TaqMan[®] principle. During PCR amplification, forward and reverse primers hybridize to the target DNA. A fluorogenic probe is included in the same reaction mixture, which consists of an oligonucleotide labeled with a 5'-reporter dye and a downstream 3'-quencher. During PCR amplification, the probe is cleaved and the reporter dye and quencher are separated. The resulting increase in fluorescence can be detected on a range of real-time PCR platforms. The monitoring of the fluorescence intensities during the real-time PCR allows the detection of accumulating product without re-opening the reaction tubes after the PCR run.

The kit minimizes contamination risk and contains all reagents needed for detection (except for PCR-grade H₂O).

3.1 Internal Amplification Control

This kit contains the Internal Positive Control (IC) as a PCR inhibition Control. The IC allows the user to determine and control possible PCR inhibition. The IC reagents are included in the primer/probe mixture and the IC is co-amplified with target DNA from the tested samples. The results can be visualized in the HEX (VIC) channel.



4. Contents

This kit is intended for 50 reactions, including controls.

Table 1: Kit Contents

Reagent	Cap Label	Volume	Description
2x real-time PCR Master Mix	2xM	500 µL	Buffer containing dNTPs, MgCl ₂ and Taq DNA polymerase
Primer / Probe Mixture	P	200 µL	Primer/ probe mixture: <ul style="list-style-type: none"> • <i>groEL</i>-specific primer and probe • IC-specific primer and probe • IC DNA
Control DNA	C	50 µL	Positive control DNA

5. Additionally required materials, reagents and devices

- Disposable powder-free gloves and laboratory coat
- Pipettors (0.5 to 10 µL, 2 to 20 µL, 20 to 200 µL, 200 to 1,000 µL)
- Sterile aerosol-barrier pipette tips
- Ice or benchtop cooler
- Vortex mixer
- Clean bench area or PCR box
- Tabletop centrifuge with rotor for 2 mL reaction tubes
- Real-time thermal cycler with FAM and HEX (VIC) detection channels
- Disposable polypropylene microtubes for PCR
- PCR-grade H₂O
- For DNA Extraction: foodproof® StarPrep® Two Kit or equivalent

6. General precautions

- Store extracted positive material (samples, controls and other amplicons) away from all other reagents and add to the reaction mix in a separate area.
- Thaw all components thoroughly on ice before starting the experiment.
- When thawed, mix the components and centrifuge briefly.
- Do not pipette by mouth.
- Do not eat, drink, smoke, apply cosmetics or handle contact lenses in laboratory work areas.
- Do not use a kit beyond its expiration date.
- Safety Data Sheets (SDS) can be found at www.hygiena.com/documents.
- Use disposable gloves, laboratory coats and eye protection while handling samples and reagents. Thoroughly wash hands afterward.
- Dispose of all samples and unused reagents in compliance with local regulations.
- Specimens should be considered potentially infectious and handled in a biological cabinet in accordance with Biosafety Level 2 or other appropriate biosafety practices.



- Clean and disinfect all sample or reagent spills using a disinfectant such as 0.5% sodium hypochlorite or other suitable disinfectant.
- Avoid contact of specimens and reagents with the skin, eyes and mucosa. If contact occurs with skin, eyes or mucosa, immediately flush with water and seek medical attention.
- Use of this product should be limited to personnel trained in laboratory techniques of DNA amplification.
- To avoid carry-over contamination with PCR product or control DNA, please note the following points:
 1. Be careful not to contaminate the Primer/Probe Mixture and 2x real-time PCR Master Mix with other PCR products or Control DNA through pipetting. To prevent contamination, the use of aerosol-barrier tips is recommended.
 2. Open and close all sample tubes carefully. Avoid splashing or spraying PCR samples.
 3. It is important to have designated lab areas where PCR reactions are set up, preferentially separated in space from the areas where PCR reactions are analyzed.
 4. The laboratory process must be one-directional; it should begin in the Extraction Area and move to the Amplification and Detection Area. Do not transport samples, equipment and reagents to the areas where you performed previous steps.

7. Sampling and handling

7.1 Sample Collection

Various food source samples, environmental samples, clinical material and cultured bacteria are routinely examined.

7.2 Sample Storage

The assay sensitivity can be reduced if you routinely freeze the samples before testing or store them for an extended period of time. Avoid repeated freezing and thawing of samples, which may lead to DNA degradation and decreased sensitivity.

7.3 Nucleic Acid Extraction

Carry out DNA isolation according to the extraction kit's product instructions. For more information, please see www.hygiena.com.

8. Protocol

8.1 DNA Isolation

Hygiena Diagnostics provides sample preparation kits suitable for all kinds of foods and raw materials.

(See 5. "Additional Required Materials, Reagents and Devices")

8.2 Preparing the PCR

To prevent the risk of contamination with foreign DNA, we recommend that all experiment steps be performed in a PCR cleanroom or separated environment area. Aerosol-barrier pipette tips are recommended for each step.



8.2.1 Thawing the Kit Components

The use of ice or a benchtop cooler is recommended during experiments to maintain enzyme activity.

8.2.2 Prepare Reaction Master Mix

Each reaction has a total volume of 20 μL ; the volume of the DNA sample is 6 μL .

1. Prepare the reaction mixture according to Table 2 below.

Table 2: PCR reaction mixture

Composition	Volume
Primer / Probe Mixture	4 μL
2x real-time PCR MasterMix	10 μL
Total	14 μL

2. Add 6 μL of extracted DNA sample into the tube.

8.2.3 Prepare Control Amplification Reactions

CONTROL +

- Positive control amplification: Add 6 μL of Control DNA instead of sample DNA.

CONTROL -

- Negative control amplification: Add 6 μL of PCR-grade H_2O instead of sample DNA

8.2.4 Mixing

Mix the reagents in the PCR reaction tubes by tapping a minimum of 5 times. Briefly centrifuge the tubes to remove air bubbles or drops inside the cap.

8.3 Amplification

- Program your real-time PCR instrument according to the manufacturer's manual.
- Create a temperature-time profile on your instrument as follows in Table 3.

Table 3: Temperature Time Profile

Temperature	Time	Cycle
95 °C	10 min	1
95 °C	15 s	40
60 °C*	1 min	

* Detect the fluorescence at this step.



9. Data analysis

The fluorescence curves are analyzed in FAM and HEX (VIC) fluorescence detection channels (see Table 4). You can predict the presence or absence of the target gene in your samples by analyzing the real-time PCR results.

Table 4: Specific Detection on Fluorescence Channel

Target Gene	Fluorophore
<i>groEL</i>	FAM
IC	HEX (VIC)

9.1 Interpretation of Results

- The signal is considered to be positive if the corresponding fluorescence accumulation curve crosses the threshold line.
- Results are accepted as relevant if both positive and negative amplification controls pass.
- **IC:** When amplifying a target sample with a high copy number, the IC may not produce an amplification plot. This does not invalidate the test and should be interpreted as a positive experimental result.

Table 5: Interpretation of Results

	Positive Control	Negative Control	<i>groEL</i>	IC	Interpretation
Case 1	+	-	+	+	<i>groEL</i> gene is detected.
Case 2	+	-	+	-*	
Case 3	+	-	-	+	<i>groEL</i> gene is not detected.
Case 4	+	-	-	-	Invalid result; retest
Case 5	+	+	+/-	+/-	
Case 6	-	+/-	+/-	+/-	

* Detection of the Internal Amplification Control in the respective channel is not required for a positive result. A high copy number of target gene can lead to reduced or absent Internal Amplification Control signal.



10. Troubleshooting

Situation	Possible cause	Recommendation
Negative control samples are positive.	Carry-over contamination	<ul style="list-style-type: none"> • Exchange all critical solutions. • Repeat the analysis of all tests with fresh aliquots of all reagents. • Take measures to detect and eliminate the source of contamination.
No signal is detected for amplification positive controls.	Incorrect programming of the real-time PCR instrument.	<ul style="list-style-type: none"> • The PCR should be repeated after checking the programming of instruments, storage conditions and the expiration date.
	The kit reagents have expired.	
	Kit components have not been stored according to the manufacturer's instructions.	
No signal is detected for IC in HEX (VIC) channel and <i>groEL</i> gene in FAM channel.	<ul style="list-style-type: none"> • Incorrect PCR reaction • Pipetting errors • Omitted reagents 	<ul style="list-style-type: none"> • The PCR should be repeated after checking for correct pipetting scheme and reaction setup.
	PCR inhibitors are present at a high concentration.	<ul style="list-style-type: none"> • DNA extraction should be repeated.

11. Stability and Storage

Store the kit at -15 to -25 °C through the expiration date printed on the label.

12. Specifications

- **Sensitivity**
The limit of detection (LOD) is 10 to 100 genetic equivalents (GE).
- **Specificity**
100% exclusivity for approximately 100 non-target strains

13. Quality control

In compliance with Federal State Institution of Science “Central Research Institute of Epidemiology” ISO 13485 – certified Quality Management System, each lot of foodproof SL *Bacillus cereus* Detection Kit has been tested against predetermined specifications to ensure consistent product quality.



14. Ordering information

Product	Order No.	# Tests
foodproof SL <i>Bacillus cereus</i> Detection Kit	KIT230201	50 reactions
foodproof StarPrep Two	KIT230177	96 reactions

15. Supplementary Information

15.1 Ordering Information

Hygiena Diagnostics offers a broad range of reagents and services. For a complete overview and for more information, please visit our website at www.hygiena.com.

15.3 Trademarks

foodproof®, **microproof**®, **vetproof**®, **ShortPrep**®, **StarPrep**®, **RoboPrep**® and **LyoKit**® are registered trademarks of Hygiena Diagnostics GmbH. Hygiena® is a registered trademark of Hygiena. Other brand or product names are trademarks of their respective holders.

Other brand or product names are trademarks of their respective holders.

15.4 Contact and Support

If you have questions or experience problems with this or any other product of Hygiena Diagnostics GmbH, please contact our Technical Support staff (www.hygiena.com/support). Our scientists commit themselves to providing rapid and effective help. We also want you to contact us if you have suggestions for enhancing our product performance or using our products in new or specialized ways. Such customer information has repeatedly proven invaluable to us and the worldwide research community.

15.5 Reference Number

The reference number and original Hygiena Diagnostics GmbH article number: Z 700 06

16. Change Index

Version 1, October 2014

First version of the package insert.

Revision A, March 2024

Rebranding and new layout.

Z 700 06 20 -> INS-KIT-230201-RevA



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