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Extended Spectrum Beta-Lactamases (ESBLs) Producing Bacteria Real Time PCR Kit User Manual

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For use with ABI Prism®7000/7300/7500/7900/Step One Plus; iCycler iQ™4/iQ™5; Smart Cycler II;Bio-Rad CFX 96;Rotor Gene™6000; Mx3000P/3005P;MJ-Option2/ Chromo4; LightCycler®480 Instrument

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1. Intended Use

Extended Spectrum Beta-Lactamases (ESBLs) Producing Bacteria Real Time PCR Kit is used for the detection drug-resistant genes of ESBLs by using real time PCR systems in samples like sputum, wound excretion, food, stool, urine, C.S.F, pleural effusion, ascites, blood and etc..

2. Principle of Real-Time PCR

The principle of the real-time detection is based on the fluorogenic 5'nuclease assay. During the PCR reaction, the DNA polymerase cleaves the probe at the 5' end and separates the reporter dye from the quencher dye only when the probe hybridizes to the target DNA. This cleavage results in the fluorescent signal generated by the cleaved reporter dye, which is monitored real-time by the PCR detection system. The PCR cycle at which an increase in the fluorescence signal is detected initially is proportional to the amount of the specific PCR product. Monitoring the fluorescence intensities during real-time allows the detection of the accumulating product without having to re-open the reaction tube after the amplification.

3. Product Description

Extended Spectrum Beta-Lactamases (ESBLs) Producing Bacteria Real Time PCR Kit contains a specific ready-to-use system for the detection 10 kinds of drug-resistant genes by polymerase chain reaction in the real-time PCR system. The master contains reagents and enzymes for the specific amplification of gene DNA. Fluorescence is emitted and measured by the real time systems´optical unit. The detection of amplified DNA fragment is performed in fluorimeter **channel FAM**. DNA extraction buffer is available in the kit. In addition, the kit contains a system to identify possible PCR inhibition by measuring the HEX/VIC/JOE fluorescence of the internal control (IC). An external positive control (1×10^7 copies/ml) contained, allows the determination of the gene load.

4. Kit Contents

Ref.	Type of Reagent	Presentation	50rxns
1	DNA Extraction Buffer	2 vials, 1.5ml	x2
2	SHV Reaction Mix	1 vial, 950µl	x2
3	TEM Reaction Mix	1 vial, 950µl	x2
4	CTX-M Reaction Mix A	1 vial, 950µl	x2
5	CTX-M Reaction Mix B	1 vial, 950µl	x2
6	OXA Reaction Mix	1 vial, 950µl	x2
7	PCR Enzyme Mix	1 vial, 60µl	x2
8	Molecular Grade Water	1 vial, 400µl	x2
9	Internal Control (IC)	1 vial, 30µl	x2
10	ESBLs Positive Control	1 vial, 150µl	x2

Analysis sensitivity: 5×10^3 copies/ml

Note: Analysis sensitivity depends on the sample volume, elution volume, nucleic acid extraction methods and other factors .If you use the DNA extraction buffer in the kit, the analysis sensitivity is the same as it declares. However, when the sample volume is dozens or even hundreds of times greater than elution volume by some concentrating method, it can be much higher.

5. Storage

- All reagents should be stored at -20 ℃. Storage at +4 ℃ is not recommended.
- All reagents can be used until the expiration date indicated on the kit label.
- Repeated thawing and freezing (>3x) should be avoided, as this may reduce the sensitivity of the assay.
- Cool all reagents during the working steps.
- Super Mix should be stored in the dark.

6. Additionally Required Materials and Devices

- Biological cabinet
- Vortex mixer
- Cryo-container
- Sterile filter tips for micro pipets
- Disposable gloves, powderless
- Refrigerator and Freezer
- Real time PCR system
- Real time PCR reaction tubes/plates
- Pipets (0.5µl – 1000µl)
- Sterile microtubes
- Biohazard waste container
- RNA extration
- Desktop microcentrifuge for "eppendorf" type tubes (RCF max. 16,000 x g)
- Tube racks

7. ⚠ Warnings and Precaution

- Carefully read this instruction before starting the procedure.
- For in vitro diagnostic use only.
- This assay needs to be carried out by skilled personnel.
- Clinical samples should be regarded as potentially infectious materials and should be prepared in a laminar flow hood.
- This assay needs to be run according to Good Laboratory Practice.
- Do not use the kit after its expiration date.
- Avoid repeated thawing and freezing of the reagents, this may reduce the sensitivity of the test.
- Once the reagents have been thawed, vortex and centrifuge briefly the tubes before use.
- Prepare quickly the Reaction mix on ice or in the cooling block.
- Set up two separate working areas: 1) Isolation of the RNA/ DNA and 2) Amplification/ detection of amplification products.
- Pipets, vials and other working materials should not circulate among working units.
- Use always sterile pipette tips with filters.
- Wear separate coats and gloves in each area.
- Do not pipette by mouth. Do not eat, drink, and smoke in laboratory.
- Avoid aerosols.

8. Sample Collection, Storage and Transport

- Collected samples in sterile tubes.
- Specimens can be extracted immediately or frozen at -20 ℃ to -80 ℃.
- Transportation of clinical specimens must comply with local regulations for the transport of etiologic agents.

9. Procedure

9.1 DNA-Extraction

DNA extraction buffer is supplied in the kit, please thaw the buffer thoroughly and spin down briefly in the centrifuge before use.

9.1.1 Sputum sample

1) **Trypsin digestive Solution preparation**. Add 10g trypsin to 200ml purified water and mix thoroughly. Adjust PH value to 8.0 with 2%NaOH solution. Add 2mL $CaCl_2$ (25mmol/L), mix thoroughly and store at 4℃. **Please incubate at 37℃ for 10 minutes before use.**2) Estimate the volume of the sputum and add partes aequales of the Trypsin digestive Solution then vortex vigorously. Set at room temperature for 30 minutes. Transfer 0.5ml mixture to a new tube. Centrifuge the tube at 13000rpm for 5 minutes, carefully remove and discard supernatant from the tube without disturbing the pellet. 3) Add 1.0ml normal saline. Resuspend the pellet with vortex vigorously. Centrifuge at 13000rpm for 5 minutes. Carefully remove and discard supernatant from the tube without disturbing the pellet. 4) Repeat step 3) 5) Add 50µl DNA extraction buffer, close the tube then suspend the pellet with vortex vigorously. Spin down briefly in a table centrifuge. 6) Incubation the tube for 10 minutes at 100 ℃.7) Centrifuge the tube at 13000rpm for 10 minutes. The supernatant contains DNA extracted and is used for PCR template.

9.1.2 Liquid samples (pleural effusion, ascites, urine , S.C.F ,etc)

1) Take 1.5 ml sample to a tube, Centrifuge the tube at 13000rpm for 2 minutes, carefully remove and discard supernatant from the tube without disturbing the pellet.2) Add 100µl DNA extraction buffer, close the tube then vortex for 10 seconds. Spin down briefly in a table centrifuge.3) Incubate the tube for 10 minutes at 100 ℃.4) Centrifuge the tube at 13000rpm for 5 minutes. The supernatant contains the DNA extracted and can be used for PCR template.

9.1.3 Stool or food sample

1) Take about 50mg stool or 1g food samples to a tube; add 1.0ml normal saline then vortex vigorously. Centrifuge the tube at 13000rpm for 2 minutes, carefully remove and discard supernatant from the tube without disturbing the pellet. 2) Add 100µl DNA extraction buffer, close the tube then resuspend the pellet with vortex vigorously. Spin down briefly in a table centrifuge.3) Incubate the tube for 10 minutes at 100 ℃.4) Centrifuge the tube at 13000rpm for 5 minutes. The supernatant contains the DNA extracted and can be used for PCR template.

9.1.4 Wound excretion sample

1) Take 1ml sample in a tube, centrifuge the tube at 13000rpm for 2min, and remove the supernatant and keep the pellet.2) Add 100µl DNA extraction buffer to the pellet, close the tube then vortex for 10 seconds. Spin down briefly in a table centrifuge.3) Incubate the tube for 10 minutes at 100 ℃.4) Centrifuge the tube at 13000rpm for 10 minutes. The supernatant contains the DNA extracted and can be used for PCR template.

9.1.5 Blood sample

1) Take 2ml non-heparin anticoagulation, and transfer the plasma layer and buffy-coat layer to another tube after it is natural stratified.2) Add 100µl DNA extraction buffer into the tube, and close the tube then vortex for 10 seconds. Spin down briefly in a table centrifuge.3) Incubate the tube for 10 minutes at 100 ℃.4) Centrifuge the tube at 13000rpm for 5 minutes. The supernatant contains DNA extracted and can be used for PCR template.

Attention:

A. During the incubation, make sure the tube is not open, as the vapor will volatilize into the air and may cause contamination in case the sample is positive.

B. The extraction sample should be used in 3 hours or stored at -20 ℃ for one month.

C. DNA extraction kits are available from various manufacturers. You may use your own extraction systems or the commercial kit based on the yield. For DNA extraction, please comply with the manufacturer's instructions.

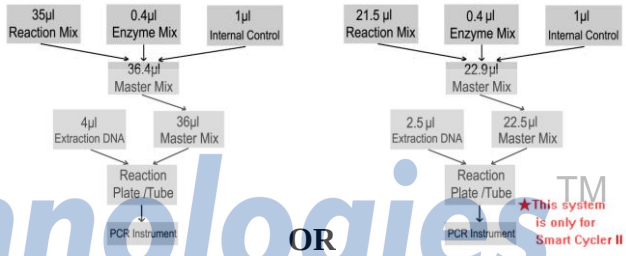
9.2 Internal Control

It is necessary to add internal control (IC) in the reaction mix. Internal control (IC) allows the user to determine and control the possibility of PCR inhibition.

Add the internal control (IC) 1µl/rxn and the result will be shown in the HEX/VIC/JOE.

9.4 PCR Protocol

The Master Mix volume for each reaction should be pipetted as follows:



※PCR system without HEX/VIC/JOE channel may be treated with 1µl Molecular Grade Water instead of 1µl IC.

1) The volumes of Reaction Mix and Enzyme Mix per reaction multiply with the number of samples, which includes the number of controls, standards, and sample prepared. Molecular Grade Water is used as the negative control. For reasons of unprecise pipetting, always add an extra virtual sample. Mix completely then spin down briefly in a centrifuge.
2) Pipet **36µl (22.5µl for SmartCycler II)** Master Mix with micropipets of sterile filter tips to each real time PCR reaction plate/tubes. Separately add **4µl (2.5µl for SmartCycler II)** DNA sample, positive and negative controls to different reaction plate/tubes. Immediately close the plate/tubes to avoid contamination.
3) Spin down briefly in order to collect the Master Mix in the bottom of the reaction tubes.
4) Perform the following protocol in the instrument:

37 ℃ for 2min	1cycle
94 ℃ for 2min	1cycle
93 ℃ for 15sec, 60 ℃ for 1min (Fluorescence measured at 60 ℃)	40cycles

Selection of fluorescence channels as follows:

Reaction Mix	FAM	HEX/VIC/JOE	Cal Red 610
SHV	Most drug-resistant genes SHV	IC	——
TEM	gene TEM-1and TEM-2	——	——
CTX-M Reaction Mix A	gene CTX-M 1	gene CTX-M 2	gene CTX-M 9
CTX-M Reaction Mix B	gene CTX-M 8	gene CTX-M 25	——
OXA	gene OXA 10	gene OXA 1	gene OXA 2

5) ⚠ If you use ABI Prism® system, please choose **"none"** as **passive reference** and **quencher**.

10. Threshold setting: just above the maximum level of molecular grade water.

11. Calibration for quantitative detection: Input each concentration of standard controls at the end of run, and a standard curve will be automatically formed.

12. Quality control: Negative control, positive control and internal control must be performed correctly, otherwise the sample results is invalid.

1) Molecular Grade water in channel HEX of SHV reaction mix should be detected positive with Ct value 25~35.Otherwise, the negative result of samples is not unbelievable.

2) Ct value of Positive Control in target gene channels of 5 reaction mixs should be all ≤35.

13. Data Analysis and Interpretation: The following sample results are possible:

1) The Ct value in target gene channels (from①~⑩ in table below) shows ≤35. The result is positive.

2) The Ct value in all target gene channels shows 35~40, please repeat again. If the result still shows 35~40,it can be considered negative.

Reaction Mix	FAM	HEX/VIC/JOE	Cal Red 610/ROX/TEXAS RED
SHV Reaction Mix	①	IC	——
TEM Reaction Mix	②	——	——
CTX-M Reaction Mix A	③	⑥	⑨
CTX-M Reaction Mix B	④	⑦	——
OXA Reaction Mix	⑤	⑧	⑩

3) Neither in all target gene channels nor in IC channel is a signal detected. A diagnostic statement can not be made. Inhibition of the PCR reaction.