

PrimerDesign™ Ltd

Quantification of *Vibrio cholerae* genomes

ctxB (cholera toxin) gene

For general laboratory and research use only

Standard Kit





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Introduction to *Vibrio cholerae*

Cholera, sometimes known as epidemic cholera, is an infectious gastroenteritis caused by the bacterium *Vibrio cholerae*. Transmission to humans occurs through the process of ingesting contaminated water or food. The major reservoir for cholera was long assumed to be humans themselves, but considerable evidence exists that aquatic environments can serve as reservoirs of the bacteria.

V. cholerae is a Gram-negative bacterium that produces cholera toxin, an enterotoxin, whose action on the mucosal epithelium lining of the small intestine is responsible for the characteristic massive diarrhoea of the disease. In its most severe forms, cholera is one of the most rapidly fatal illnesses known, and a healthy person may become hypotensive within an hour of the onset of symptoms; infected patients may die within three hours if treatment is not provided. In a common scenario, the disease progresses from the first liquid stool to shock in 4 to 12 hours, with death following in 18 hours to several days without rehydration treatment.

Specificity

The *PrimerDesign™ Quantification Kit for Vibrio cholerae* Genomes is designed for the *in vitro* quantification of subtypes that carry the cholera toxin gene. The primers have 100% homology with all reference sequences included in the NCBI reference database and therefore have a very broad quantification profile.

Accession numbers for detected sequences

EF591295.1, CP000626.1, AE003853.1, EF158842.1, AY349176.1, X76390.1



Kit Contents

- Pathogen specific primer/probe mix (150 reactions **BROWN**)
- Pathogen positive control template (for Standard curve **RED**)
- RNase/DNase free water

Reagents and equipment to be supplied by the user

- Real-Time PCR Instrument
- **Mastermix or Mastermix components**
This kit is designed to work well with all commercially available Mastermixes. However, we recommend the use of PrimerDesign 2x *Precision*[™] Mastermix.
- Pipettors and Tips
- Vortex and centrifuge
- Thin walled 1.5 ml PCR reaction tubes

Kit storage

This kit is stable at room temperature. Once the lyophilized components have been re-suspended the kit should be stored at -20°C. Unnecessary repeated freeze/thawing should be avoided. Under these conditions reagents are stable for six months from date of purchase.



Suitable sample material

All kinds of sample material suited for PCR amplification can be used. Please ensure the samples are suitable in terms of purity, concentration, and RNA/DNA integrity. Always run at least one negative control with the samples. To prepare a negative-control, replace the template RNA sample with RNase/DNase free water.

Dynamic range of test

Under optimal PCR conditions PrimerDesign pathogen detection kits have very high priming efficiencies of >95% and can detect between 1×10^8 and 1×10^2 copies of target template.



Principles of the test

Real-Time PCR

A pathogen specific primer and probe mix is provided and the target sequence can be detected through the **FAM** channel.

The primer and probe mix provided exploits the so-called TaqMan[®] principle. During PCR amplification, forward and reverse primers hybridize to the pathogen DNA/cDNA. 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.

Positive control

For copy number determination, and as a positive control for the PCR set up, the kit contains positive control template. This can be used to generate a standard curve of pathogen copy number / CT value. Alternatively the positive control can be used at a single dilution for a qualitative analysis of the samples. Each time the kit is used, at least one positive control reaction must be included on the run. A positive result indicates that the primers and probes for quantification of the target pathogen gene are working properly in your particular experimental scenario. If a negative result is obtained the test results are invalid and must be repeated. Care should be taken to ensure that the positive control does not contaminate any other kit component which would lead to false positive results. This can be achieved by handling this component in a Post PCR environment.

Negative control

To confirm absence of contamination, a negative control reaction should be included every time the kit is used. For this reaction, the RNase/DNase free water should be used instead of template. A negative result indicates that the reagents have not become contaminated while setting up the run. If a positive result is obtained the results should be ignored and the test samples repeated. Possible sources or contamination should first be explored and removed.



Carry-over prevention using UNG (optional)

Carry over contamination between PCR reactions can be prevented by including uracil-N-glycosylase (UNG) in the reaction mix. Some commercial mastermix preparations contain UNG or alternatively it can be added as a separate component. UNG can only prevent carry over from PCR reactions that include deoxyuridine triphosphate (dUTP) in the original PCR reaction. PrimerDesign recommend the application of 0.2 U UNG per assay with a 15 minute incubation step at 37°C prior to amplification. The heat-labile UNG is then inactivated during the Taq polymerase activation step (95°C for 10 minutes).



Bench side Protocol

To minimize the risk of contamination with foreign DNA, we recommend that all pipetting be performed in a PCR clean environment. Ideally this would be a designated PCR lab or PCR cabinet. Barrier tips are recommended for all pipetting steps.

1. Pulse-spin each tube in a centrifuge before opening.

This will ensure lyophilised primer and probe mix is in the base of the tube and is not spilt upon opening the tube.

2. Reconstitute the kit components according to the table below

To ensure complete reconstitution, vortex each tube thoroughly, allow to stand for 5 minutes and vortex again before use.

| Component | Volume |
|--|--------|
| Pre-PCR box | |
| Primer/Probe mix (BROWN) | 165 µl |
| Post-PCR bottle | |
| Positive Control Template (RED) * | 500 µl |

* This component contains high copy number template and is a VERY significant contamination risk. It must be opened and handled in a separate laboratory environment, away from the other components.



Real-time PCR detection

1. Prepare a reaction mix according to the table below

Include sufficient reactions for the standard curve wells (8 samples in duplicate) and also the negative control.

Pathogen detection mix

| Component | 1 reaction |
|--|--------------|
| 2X Precision™ Mastermix | 10 µl |
| Pathogen primer/probe mix (BROWN) | 1.0 µl |
| RNAse/DNAse Free water | 4.0 µl |
| Final volume | 15 µl |

2. Pipette 15µl of this mix into each well according to your real-time PCR experimental plate set up.

3. Prepare sample DNA templates for each of your samples (suggested concentration 5ng/µl) in RNAse/DNAse free water.

If the concentration of DNA is not known, then dilute your DNA sample reactions 1:20 (10 µl of sample DNA and 190µl of water)

4. Pipette 5µl of diluted template into each well, according to your experimental plate set up.

For negative control wells use 5µl of RNAse/DNAse free water. The final volume in each well is 20µl



5. Preparation of standard curve dilution series

- 1) Pipette 900 μ l of RNase/DNase free water into 7 tubes and label 2-8
- 2) Pipette 100 μ l of Positive Control Template (**RED**) into tube 2
- 3) Vortex thoroughly
- 4) Change pipette tip and pipette 100 μ l from tube 2 into tube 3
- 5) Vortex thoroughly

Repeat steps 4 and 5 to complete the dilution series

| Standard Curve | Copy Number |
|--|-----------------------------|
| Tube 1 Positive control (RED) | 2×10^7 per μ l |
| Tube 2 | 2×10^6 per μ l |
| Tube 3 | 2×10^5 per μ l |
| Tube 4 | 2×10^4 per μ l |
| Tube 5 | 2×10^3 per μ l |
| Tube 6 | 2×10^2 per μ l |
| Tube 7 | 20 per μ l |
| Tube 8 | 2 per μ l |

6. Pipette 5 μ l of standard template into each well, according to your experimental plate set up.

The final volume in each well is 20 μ l.



Amplification Protocol

Amplification conditions using PrimerDesign 2X Precision™ MasterMix.

| | Step | Time | Temp |
|-----------|------------------------------------|---------|------|
| | UNG treatment (if required) ** | 15 mins | 37°C |
| | Enzyme Activation (if required)*** | 10 mins | 95°C |
| 50 cycles | Denaturation | 10s | 95°C |
| | DATA COLLECTION* | 60s | 60°C |

* Fluorogenic data for the control DNA should be collected during this step through the FAM channel

** Required if your mastermix includes UNG to prevent PCR carryover contamination

*** Not all Mastermixes require this enzyme activation step. Follow the manufactures instructions for your mastermix.



Notices and disclaimers

During the warranty period PrimerDesign pathogen detection kits allow precise and reproducible data recovery combined with excellent sensitivity. For data obtained by violation to the general GLP guidelines and the manufacturer's recommendations the right to claim under guarantee is expired.

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