

PrimerDesign™ Ltd

Quantification of *Aggregatibacter actinomycetemcomitans* genomes

hemoglobin-bindingprotein (hbpA) gene

For general laboratory and research use only

Standard Kit





Contents

Introduction to <i>Aggregatibacter actinomycetemcomitans</i>	3
Specificity	3
Kit Contents	4
Reagents and equipment to be supplied by the user	4
Kit storage	4
Suitable sample material	5
Dynamic range of test	5
Principles of the test	6
Bench side Protocol	8
Amplification Protocol	11
Notices and disclaimers	12
Trademarks	12



Introduction to *Aggregatibacter actinomycetemcomitans*

Aggregatibacter actinomycetemcomitans is a non-motile, rod-shaped, Gram-negative bacterium. This bacterium is also a facultative anaerobe which can grow under aerobic or anaerobic conditions. The 43Kbp genome is arranged in a circular configuration and contains up to 60 open reading frames. The outer surface of the cell includes appendages known as fimbriae which are used for host cell adhesion.

A. actinomycetemcomitans inhabits the human oral cavity where it adheres to the mucosal tissue of the gum using fimbriae. Here, they are able to create a biofilm with other resident bacterial species that if not treated can cause periodontitis or gingivitis.

The bacterium produces leukotoxin which can be found on the outer bacterial membrane and is used to avoid the host cell immune response. This evasion allows the bacteria to stimulate a chronic inflammatory response that leads to damage of the periodontium which includes connective tissue, ligaments and bone.

The damage to the periodontium that is caused by *A. actinomycetemcomitans* results in redness, bleeding or swelling of the gums which progresses to recession of the gums that can lead to deep pockets forming between the teeth when the attached gingiva is destroyed. Eventually the teeth will become loose and fall out.

Specificity

The *PrimerDesign™ Quantification Kit for A. actinomycetemcomitans* genomes is designed for the *in vitro* quantification of all clinical isolates. The haemoglobin binding protein gene has previously been identified as a highly specific marker for *A. actinomycetemcomitans* (J. Periodont Res 2008; 43: 352-359). The primers and probe have 100% homology with all reference sequences for *A. actinomycetemcomitans* in the NCBI database.

EF142372.I, EF142371.I, EF142368.I, EF142367.I, EF142366.I, EF142364.I, EF142363.I, AF359451.I, AF359444.I, AF359442.I, EF142443.I, EF142442.I, EF142441.I, EF142440.I, EF142439.I, EF142438.I, EF142437.I, EF142436.I, EF142435.I, EF142434.I, EF142433.I, EF142432.I, EF142431.I, EF142430.I, EF142429.I, EF142428.I, EF142427.I, EF142426.I, EF142425.I, EF142424.I, EF142423.I, EF142422.I, EF142421.I, EF142420.I, EF142419.I, EF142418.I, EF142417.I, EF142416.I, EF142415.I, EF142414.I, EF142413.I, EF142412.I, EF142411.I, EF142410.I, EF142409.I, EF142408.I, EF142407.I, EF142406.I, EF142405.I, EF142404.I, EF142403.I, EF142402.I, EF142401.I, EF142400.I, EF142399.I, EF142398.I, EF142397.I, EF142396.I, EF142395.I, EF142394.I, EF142393.I, EF142392.I, EF142391.I, EF142390.I, EF142389.I, EF142388.I, EF142387.I, EF142386.I, EF142385.I, EF142384.I, EF142383.I, EF142382.I, EF142381.I, EF142380.I, EF142379.I, EF142378.I, EF142377.I, EF142376.I, EF142375.I, EF142374.I, EF142373.I, EF142370.I, EF142369.I, EF142365.I, AF359450.I, AF359449.I, AF359448.I, AF359447.I, AF359446.I, AF359445.I, AF359443.I



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*TM Mastermix.
- Pipettors and Tips
- Vortex and centrifuge
- Thin walled 1.5 ml PCR reaction tubes

Kit storage

This kit is stable at room temperature but should be stored at -20°C on arrival. Once the lyophilized components have been re-suspended 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 μ l
Post-PCR bottle	
Positive Control Template (RED) *	500 μ l

* 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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