

Primerdesign™ Ltd
R00402

Epstein–Barr virus, Cytomegalovirus & Polyomavirus BK

Kit version: 2

Epstein-Barr virus (BNRF1 gene)

Cytomegalovirus (AD169 major immediate-early
antigen gene)

Polyomavirus BK (VP2 gene)

genesig® PLEX kit

100 tests

G E N E S I G

Kits by Primerdesign

Specificity of primers and probes last reviewed on:

11th Jan 2022

For general laboratory and research use only

Introduction

EBV

Epstein-Barr Virus (EBV) is a member of the herpesvirus family (HHV-4), and one of the most common human viruses. In the United States, as many as 95% of adults between 35 and 40 years of age have been infected. Epstein-Barr can cause Infectious mononucleosis, also known as 'glandular fever', 'Mono' and 'Pfeiffer's disease'. There is a body of evidence linking EBV and cancer formation especially in Burkitt's lymphoma and Nasopharyngeal carcinoma.

CMV

Cytomegalovirus (CMV) is the most common congenital infection in the United States. Cytomegalovirus, or CMV is found universally throughout all geographic locations and socioeconomic groups and infects between 50% and 85% of adults in the United States by 40 years of age. CMV infection is more widespread in developing countries and in areas of lower socioeconomic conditions. For most healthy persons who acquire CMV after birth there are few symptoms. However, CMV infection is important to certain high-risk groups, such as unborn and newborn babies, people who work with children or immunocompromised people such as organ transplant recipients and persons infected with human immunodeficiency virus (HIV).

BKV

BK virus is a member of the genus Betapolyomavirus within the family Polyomaviridae. Polyomaviruses are DNA-based (double-stranded DNA, ~5000 base pairs, circular genome), small (40-50 nanometers in diameter), icosahedral in shape and do not have a lipoprotein envelope. They are potentially oncogenic; they often persist as latent infections in a host without causing disease but may produce tumours in a host of a different species, or a host with an ineffective immune system.

BK virus produces a mild respiratory infection and can affect the kidneys of immunosuppressed transplant patients. In Jan 2008, a new species, Merkel cell polyoma virus, was described as the likely causative agent of Merkel skin cancer.

All the polyomaviruses are highly common childhood and young adult infections. Most of these infections appear to cause little or no symptoms. These viruses are probably lifelong persistent among almost all adults. Diseases caused by human polyomavirus infections are most common among persons who become immunosuppressed by AIDS, old age or after transplantation.

Specificity

The genesig®PLEX kit is designed for the in vitro detection of Epstein Barr Virus (EBV also known as HHV4), Cytomegalovirus (CMV also known as HHV5) and Polyomavirus BK (BKV). At the time of the most recent review, the assays within this kit are predicted to detect over 95% of sequences available from the NCBI database.

The dynamics of genetic variation means that new sequence information may become available after the initial design. Primerdesign™ periodically reviews the detection profiles of our kits and when required releases new versions.

If you require further information or have a specific question about the detection profile of this kit, then please send an email to techsupport@primerdesign.co.uk and our team will answer your question.

Kit contents

- **Multiplex primer/probe mix (100 reactions BROWN)**
FAM, VIC, ROX and Cy5 labelled (see table below)

Target	Fluorophore
EBV	FAM
CMV	VIC
BKV	ROX
Endogenous control	Cy5

- **Multiplex positive control template (RED)**
- **2x Lyophilised oasig™ Master Mix (SILVER)**
- **2x oasig™ resuspension buffer (BLUE)**
- **Template preparation buffer (YELLOW)**
for resuspension of positive control template
- **RNase/DNase free water (WHITE)**
for resuspension of primer/probe mix

Reagents and equipment to be supplied by the user

Real-time PCR Instrument

DNA extraction kit

This kit is recommended for use with genesig® EASY DNA/RNA Extraction kit. However, it is designed to work well with all processes that yield high quality DNA with minimal PCR inhibitors.

Pipettors and filter tips

Vortex and centrifuge

1.5ml microtubes

qPCR plates or reaction tubes

Kit storage and stability

This kit is stable at room temperature but should be stored at -20°C on arrival. Once the lyophilised components have been resuspended they should not be exposed to temperatures above -20°C for longer than 30 minutes at a time and unnecessary repeated freeze/thawing should be avoided. The kit is stable for six months from the date of resuspension under these circumstances.

Primerdesign™ does not recommend using the kit after the expiry date stated on the pack.

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 DNA sample with RNase/DNase free water.

Dynamic range of test

Under optimal PCR conditions the kit can achieve priming efficiencies between 90-110% and detect less than 100 copies of target template.

Notices and disclaimers

This product is developed, designed and sold for research purposes only. It is not intended for human diagnostic or drug purposes or to be administered to humans unless clearly expressed for that purpose by the Food and Drug Administration in the USA or the appropriate regulatory authorities in the country of use. During the warranty period Primerdesign™ genesig® 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. PCR is a proprietary technology covered by several US and foreign patents. These patents are owned by Roche Molecular Systems Inc. and have been sub-licensed by PE Corporation in certain fields. Depending on your specific application you may need a license from Roche or PE to practice PCR. Additional information on purchasing licenses to practice the PCR process may be obtained by contacting the Director of Licensing at Roche Molecular Systems, 1145 Atlantic Avenue, Alameda, CA 94501 or Applied Biosystems business group of the Applied Biosystems Corporation, 850 Lincoln Centre Drive, Foster City, CA 94404. In addition, the 5' nuclease assay and other homogeneous amplification methods used in connection with the PCR process may be covered by U.S. Patents 5,210,015 and 5,487,972, owned by Roche Molecular Systems, Inc., and by U.S. Patent 5,538,848, owned by The Perkin-Elmer Corporation.

Trademarks

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Principles of the test

Real-time PCR

Individual primer and probes designed for each virus have been combined into a single reaction and these can be detected through the different fluorescent channels as described in the kit contents.

The primer and probe mix provided exploits the so-called TaqMan® principle. During PCR amplification, forward and reverse primers hybridise to the target DNA. Fluorogenic probes are included in the same reaction mixture which consist of a DNA probe labelled with a 5'-dye and a 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 qPCR platforms.

Positive control

For a positive control, the kit contains a single positive control that contains templates for the three targets in the test. The kit positive control will give an EBV signal through the FAM channel, a CMV signal through the VIC channel and a BKV signal through the ROX channel. Each time the kit is used, at least one positive control reaction must be included in the run. A positive result indicates that the primers and probes for detecting each virus are working properly in that particular run. 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 the positive control in a post PCR environment. Care should also be taken to avoid cross-contamination of other samples when adding the positive control to the run. This can be avoided by sealing all other samples and negative controls before pipetting the positive control into the positive control well.

Negative control

To confirm the 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. It is also known as a No Template Control or NTC.

Endogenous control

To confirm extraction of a valid biological template, the single primer/probe mix supplied contains primers and probe designed to detect an endogenous gene. Detection of the endogenous control is through the Cy5 channel. A poor endogenous control signal may indicate that the sample did not contain sufficient biological material.

Resuspension protocol

To minimise the risk of contamination with foreign RNA/DNA, we recommend for all pipetting to be performed in a PCR clean environment. Ideally this would be a designated PCR lab or PCR cabinet. Filter 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 lost upon opening the tube.

2. Resuspend the primer/probe mix in the RNase/DNase free water supplied, according to the table below:

To ensure complete resuspension, vortex the tube thoroughly.

Component – resuspend in water	Volume
Pre-PCR pack	
Multiplex primer/probe mix (BROWN)	110µl

3. Resuspend the positive control template in the template preparation buffer supplied, according to the table below:

To ensure complete resuspension, vortex the tube thoroughly.

Component – resuspend in template preparation buffer	Volume
Post-PCR heat-sealed foil	
Positive control template (RED)*	500µl

*** 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.**

4. Resuspend the lyophilised oasig™ Master Mix in oasig™ resuspension buffer, according to the table below:

Component – resuspend in oasig™ resuspension buffer	Volume
Lyophilised oasig™ Master Mix (SILVER)	525µl

qPCR detection protocol

1. For each DNA sample prepare a reaction mix according to the table below:
Include sufficient reactions for positive and negative controls.

Component	Volume
Lyophilised oasig™ Master Mix (SILVER)	10µl
Multiplex primer/probe mix (BROWN)	1µl
RNase/DNase free water (WHITE)	4µl
Final volume	15µl

2. Pipette 15µl of this mix into each well according to your qPCR experimental plate set up.
3. Pipette 5µl of DNA sample 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.
4. Pipette 5µl of positive control template into each well according to your plate set up.
The positive control contains template for EBV, CMV and BKV. The final volume in each well is 20µl.

qPCR amplification protocol

Amplification conditions using Lyophilised oasig™ Master Mix

	Step	Time	Temp
	Enzyme activation	2 mins	95°C
Cycling x 50	Denaturation	10 secs	95°C
	DATA COLLECTION*	60 secs	60°C

* Fluorogenic data should be collected during this step through the FAM, VIC, ROX and Cy5 channels.

Interpretation of results

Positive control

The positive control well should give an amplification plot through the FAM channel (EBV), the VIC channel (CMV) and the ROX channel (BKV). There is no endogenous control template within the positive control so the Cy5 channel should give no signal (flat amplification plot). The positive control signals indicate that the kit is working correctly to detect each virus.

No template control (NTC)

The NTC should give a flat line (flat amplification plots) through all channels. Signals in the NTC indicate cross contamination during plate set up.

Endogenous control

The signal obtained from the endogenous control reaction will vary according to the amount of biological material present in each sample. An early signal indicates the presence of a good yield of biological material. A late signal suggests that little biological material is present in the sample.

Sample data

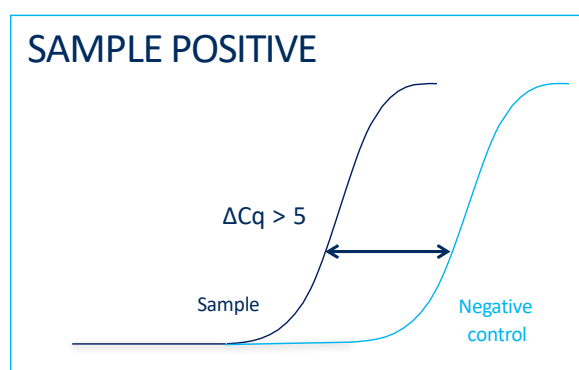
Presence of the viruses are detected in the channels indicated in the kit contents section. Positive signals indicate positive tests for those viruses. It may be possible for samples to contain multiple viruses, therefore positive results in the FAM, VIC and ROX channels may be present.

Summary of data interpretation

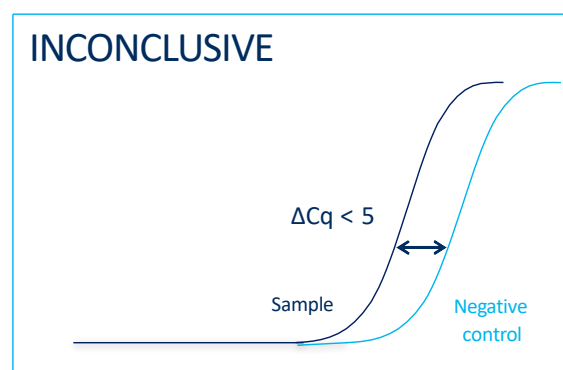
Target (FAM/VIC/ROX)	Endogenous control (Cy5)	Positive Control	Negative Control	Interpretation
FAM +	+ / -	+	-	EBV POSITIVE RESULT
VIC +	+ / -	+	-	CMV POSITIVE RESULT
ROX +	+ / -	+	-	BKV POSITIVE RESULT
-	+	+	-	NEGATIVE RESULT
+ / -	+ / -	+	≤35	EXPERIMENT FAILED Due to test contamination
+ / -	+ / -	+	>35	*
-	-	+	-	SAMPLE PREPARATION FAILED
+ / -	+ / -	-	+ / -	EXPERIMENT FAILED

Positive control template (RED) is expected to amplify between Cq 16 and 23. Failure to satisfy this quality control criterion is a strong indication that the experiment has been compromised.

* Where the test sample is positive, and the negative control is positive with a Cq >35, the sample must be reinterpreted based on the relative signal strength of the two results:



If the sample amplifies > 5 Cq earlier than the negative control, then the sample should be reinterpreted (via the table above) with the negative control verified as negative.



If the sample amplifies < 5 Cq earlier than the negative control, then the positive sample result is invalidated, and the result should be determined inconclusive due to test contamination. The test for this sample should be repeated.