# Amplisure® HSV 1&2 PCR Kit

(Real Time Quantitative PCR Kit)

IVD

**Product Insert**

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## Introduction

Herpes simplex is a viral disease caused by both herpes simplex virus 1 (HSV-1) and herpes simplex virus 2 (HSV-2). Infection with the herpes virus is categorized into one of several distinct disorders based on the site of infection. Herpes simplex is most easily transmitted by direct contact with a lesion or the body fluid of an infected individual. Transmission may also occur through skin-to-skin contact during periods of asymptomatic shedding. Barrier protection methods are the most reliable method of preventing transmission of herpes, but they merely reduce rather than eliminate risk.

Laboratory testing is often used to confirm the diagnosis. Laboratory tests include: culture of the virus, direct fluorescent antibody (DFA) studies for detection, skin biopsy, and polymerase chain reaction (PCR) to test for presence of viral DNA.

## Product Description

Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) is an *in-vitro* diagnostic kit for detection of Herpes simplex virus in human Plasma, Ocular Fluid and CSF. The kit contains the necessary reagents for performing HSV 1&2 Quantitation using Real Time PCR.

Pathogen detection by Real Time polymerase chain reaction (PCR) is based on the amplification of specific region (Glycoprotein D) of the pathogen genome. The assay principle is based on Taqman probes which allow higher specificity and sensitivity.

In addition, the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) contains a second amplification system to identify possible PCR inhibition by using an internal control (IC) without affecting the analytical sensitivity of the assay.

## Recommended Work areas

Molecular Diagnostics work area includes:

a) Sample preparation area/room – for extraction of nucleic acids from clinical samples
b) Pre-PCR area/room - for setting up PCR reaction
c) PCR area/room – for performing PCR using the thermocyclers

As part of Good Laboratory Practices (GLP), it is recommended to have dedicated areas to avoid cross contamination.

## General Precautions

### *Precautions while extracting Nucleic acid*

Always wear proper attire (powder free gloves, facemask and Head cap) before starting the nucleic acid extraction procedure. During preparation of samples, compliance with good laboratory practices are essential to minimize the risk of cross-contamination between samples, and the inadvertent introduction of Deoxyribonucleases (DNases) into samples during and after the extraction procedure. Proper aseptic technique should always be used when working with DNA.

The Sample Preparation Area is dedicated to processing samples. All reagents used in the Sample Preparation Area should remain in this dedicated area at all times. Laboratory coats, pipettes, pipette tips and vortex mixer used in the Sample Preparation Area must remain in this area and not be moved to the Pre-PCR/PCR area. Discard the gloves before leaving this area. Do not bring amplified product into the Sample Preparation Area. Usage of filter tips is recommended while sample preparation and should be performed in a Biosafety cabinet.

### *Precautions while setting up a PCR reaction*

PCR assay is sensitive and any accidental introduction of product from previous amplification reactions leads to incorrect results. Hence, measures should be taken to reduce the risk of contamination in the laboratory which includes physically separating the activities involved in performing PCR and complying with good laboratory practices.

It is recommended to have proper cleaning procedures to minimize the risk of cross contamination and carry over contamination (e.g. DNA OUT™, RNase OUT™, 0.1% Sodium Hypochlorite, Fumigation etc.).
It is recommended that areas should be defined in Pre-PCR room for preparation of mastermix and addition of templates. Laboratory coats and equipment used in the Pre-PCR Area must remain in this area and should not be moved to the Sample Preparation Area.

***Precautions for post PCR or equipment area/room***

The Real time PCR instrument/s should be kept in a separate segregated area away from Sample preparation area and Pre-PCR area.

***Precautions after completion of Real time PCR assay***

The reaction tubes or strips should be properly discarded without opening the caps, after the completion of run to avoid carry over contamination.

## Usage Limitations

1. The kit and all its components are for *in-vitro* diagnostics only.
2. The product is to be used by personnel specially trained in the *in-vitro* diagnostics procedures only.
3. Follow the product insert strictly for optimal PCR results.
4. Do not use the kit beyond the expiry date mentioned on the kit box.
5. Follow the guidelines provided in product insert for sample collection, storage and transport.
6. For ideal performance, store the kit under recommended conditions only.

## Safety Precautions

1. All patient specimens should be considered as potentially infectious and handled in a BSL2 biosafety hood with BSL3 practices.
2. Wear personal protective equipment, including gloves, head cap, face mask and lab coats when handling kit reagents/sample extraction. Wash hands thoroughly using detergents before and after performing the test.
3. Do not smoke, drink or eat in areas where kit reagents and/or human specimens are being used.
4. Dispose the unused kit reagents and human specimens as per regulatory guidelines.

## Storage Conditions and Product Stability

1. All the kit reagents should be stored at -20°C. Replace all the kit components immediately at -20°C after usage.
2. Repeated thawing and freezing (more than 6 x) of all kit reagents should be avoided, as it reduces assay sensitivity. If needed, make aliquots of the kit reagents according to the volume used in the protocol prior to freezing.
3. Allow reagents to be thawed completely on Ice/4°C prior to use.
4. Kit reagents are stable through the end of the expiration date indicated on the box when stored at -20°C.

## Symbols

| Description of Symbol | Denotation |
|---|---|
|   | *in-vitro* Diagnostic medical device |
|  | Consult Instruction manual (Product Insert) for use |
|   | Lot Number of the kit or Kit contents |
|   | Catalogue number of Kit |
|   <N> | Contains sufficient for <N> reactions (Pack Size) |
|  | Manufacturer |
|  | Temperature limitation (Storage Condition) |
|  | Use by MMM-YYYY (Expiry Date) |
|  | Biological risk (handle carefully) |
|  | Important Note |

## Kit Components

| Color Coding (Caps) | Contents | Description | 50 rxns (QT-HSV-50) | 100 rxns (QT-HSV-100) 2 x 50 rxns |
|---|---|---|---|---|
| Yellow | RAS qDNA PCR Mix | DNA Amplification Reagent | 1 x 625µL | 2 x 625µL |
| Brown | RAS HSV PPM | Primer-Probe Mix | 1 x 100 µL | 2 x 100 µL |
| Lavender | RAS HSQS1 ($2 \times 10^5$ copies/ µL) | HSV Quantitation Standards | 1 x 60 µL | 2 x 60 µL |
| Lavender | RAS HSQS2 ($2 \times 10^4$ copies/ µL) | | 1 x 60 µL | 2 x 60 µL |
| Lavender | RAS HSQS3 ($2 \times 10^3$ copies/ µL) | | 1 x 60 µL | 2 x 60 µL |
| Lavender | RAS HSQS4 ($2 \times 10^2$ copies/ µL) | | 1 x 60 µL | 2 x 60 µL |
| Natural | RAS IC-B PCR Mix | Internal Controls | 1 x 50 µL | 2 x 50 µL |
| Natural | RAS D-IC-B Ex Mix | | 1 x 1.00 mL | 2 x 1.00 mL |
| White | MBGW | Molecular Biology Grade water | 1 x 1.00 mL | 2 x 1.00 mL |

## Materials required but not supplied

The materials which are required but not supplied are listed below:

1. Viral DNA Extraction kit
2. Biosafety Cabinet
3. PCR Hood
4. Calibrated variable micropipettes
5. Sterile pipette filter tips (aerosol free)
6. Vortex mixer
7. Dry Bath

8. Benchtop centrifuge with rotor for 1.5 mL reaction tubes
9. Real Time PCR machine
10. Strip Tubes and Caps (0.2 mL) or PCR Tubes (0.2 mL) or 96 well plate
11. Cooling block (96 x 0.2 mL tubes)
12. 1.5 mL centrifuge tubes
13. 1.5 mL centrifuge tube stand
14. Cooling block (2 mL tubes)
15. Sterile powder free gloves
16. Facemask
17. Head cap
18. Lab coats

**Quality Systems**

In accordance with ISO-certified Quality Management System (9001:2008 and 13485: 2003) of RAS Lifesciences, each lot of Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) is tested against predetermined specifications to ensure consistent product quality.

**Sample Type/Collection/Storage/Transport**

**Sample Type**

Plasma ($K_2$EDTA-Blood), CSF and Ocular fluid
*Heparinized Blood must not be used as they inhibit the PCR reaction*

**Sample Collection, Storage and Transport**

3-5 mL of blood has to be drawn into a $K_2$EDTA vaccutainer. Cap and swirl the tubes for uniform mixing of blood and $K_2$EDTA. When $K_2$EDTA is used, whole blood can be collected in tubes with or without a gel separator. The $K_2$EDTA blood samples are centrifuged (20 minutes at 1000–1500 x *g)* to separate plasma from cellular material and in the case of a non gel separator tube, the plasma should be removed to a secondary sterile tube within 4 hours of phlebotomy. CSF and Ocular fluid should be collected in a sterile container/needle.

Collection and storage of unstabilized whole blood is not recommended for PCR analysis, because DNA degradation occurs in blood stored *ex vivo*. The sensitivity of the assay can be reduced if whole blood samples are frozen or stored for a longer period of time. CSF and Ocular fluid should be stored at 2 to 4 °C and should be processed within 24 hours of collection.

Plasma separated in a gel separator tube may be transported to the laboratory *in situ.* Plasma should be shipped at 2 to 8 °C and stored at -20°C as it is stable for up to five days at 2 to 8 °C and longer if frozen at -20°C or -70°C or lower. Do not store plasma samples in a "frost -free" freezer as the temperature is cycled several times per day on this type of freezer, causing degradation of nucleic acid targets. CSF and Ocular fluid should be shipped at 2 to 8 °C.

Sample material should be transported in a leak proof, unbreakable transport container to avoid leakage of sample. The samples should be transported following the local and national instructions for the transport of pathogen material.

## Assay Procedure

## DNA Extraction

Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) has been validated using the following Viral DNA extraction kits:

1- Roche High Pure Viral DNA kit (Cat. No. 11858874001)
2- QIAamp Viral DNA Mini Kit (Cat. No. 51104)

Follow the manufacturer's instructions mentioned in the manual for Viral DNA extraction. Different pack sizes of the above mentioned kits can be used. However, the customer can also validate their own extraction process using other Viral DNA extraction Kits.

## Use of Internal Control (IC)

Internal controls are supplied (RAS D-IC-B Ex Mix and RAS IC-B PCR Mix) along with Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit). This allows the user to control the Viral DNA isolation procedure as well as to check for possible PCR inhibition.

ⓘ Internal control should only be used once, either at the Extraction step or at the PCR step

### *Usage of Internal Control at the DNA extraction step*

If internal control (IC) is required to be added at the time of DNA extraction, add 20 µL of RAS *D-IC-B Ex Mix* per isolation to the lysis buffer along with other components of kit used for lysis (as per kit instructions) and vortex for 5 seconds prior to usage.

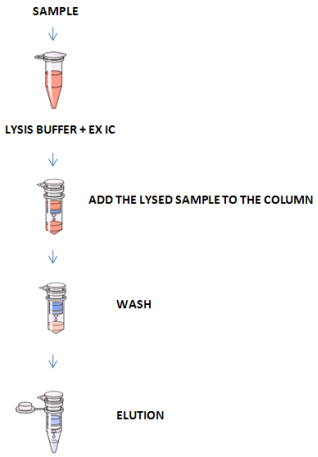


**Fig1 Viral RNA Extraction Overview**

***Usage of Internal Control at the Real time PCR step***

The internal control can optionally be used exclusively to check for possible PCR inhibition. For this application, add the internal control directly to the PCR master mix as described on Pg. No 13.

## qPCR Protocol

### Preparation of Reaction Mastermix

Quantitation procedure with Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) involves *one step qPCR*. It is recommended that a minimum of three standards and a negative control (MBGW should be used as negative control) are required to be included in a single run for acquiring proper results.

Set up a real time one step qPCR reaction as below

***1- qPCR reaction mix composition without Internal Control (When RAS D-IC-B Ex Mix is added during DNA extraction)***

| Components | Volume per reaction ( µL) (for final vol. of 25 µL) |
|---|---|
| RAS qDNA PCR Mix | 12.5 |
| RAS HSV PPM | 2.0 |
| DNA/HSQS/ MBGW | 5.0 |
| MBGW | 5.5 |

***2- qPCR reaction mix composition with Internal Control (When RAS D-IC-B Ex Mix is not added during DNA extraction)***

| Components | Volume per reaction ( µL) (for final vol. of 25 µL) |
|---|---|
| RAS qDNA PCR Mix | 12.5 |
| RAS HSV PPM | 2.0 |
| DNA/HSQS/ MBGW | 5.0 |
| RAS IC-B PCR Mix | 1.0 |
| MBGW | 4.5 |

1. **Addition of IC-B PCR mix (if required) should be done at the time of preparation of master mix.**
2. **The results may be inconsistent, if the IC-B PCR mix is added individually.**

Place the PCR plate/tubes/strips in real time thermocycler.

## PCR Programming

The Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) is validated on the following instruments:

- Rotor-Gene™ 6000
- Rotor-Gene™ Q 5plex
- ABI 7500 DX Real-Time PCR System
- ABI 7300 Real-Time PCR System
- Eppendorf Realplex 4
- Bio-Rad™ CFX 96

### *Plate Setup*

1. Program the plate setup by labeling the slots as per tube/strip/plate labels. The sequence of labeling of slots should be the same way as the tube/strip/plate is kept in the machine.
2. Select the type of sample (Unknown/QS/NTC) for each slot.
3. Select the channel for acquisition (FAM/Yakima Yellow).

| S. No. | Name of channel | Source wavelength (nm) | Detection wavelength (nm) |
|---|---|---|---|
| 1. | FAM (Pathogen target) | 470 | 510 |
| 2. | Yakima Yellow (Internal Control) | 530 | 555 |

4. For background calibration in different instruments, follow the procedure described below:

| | |
|---|---|
| Rotor-Gene™ 6000 | - Perform 'Gain optimization' |
| Rotor-Gene™ Q 5plex | - Perform 'Gain optimization' |
| ABI 7500 DX Real-Time PCR System | - Select Passive Reference dye 'ROX' |
| ABI 7300 Real-Time PCR System | - Select Passive Reference dye 'ROX' |
| Eppendorf Realplex 4 | - Select 'ROX' for background calibration |
| Bio-Rad™ CFX 96 | - Select 'ROX' for background calibration |

**Preparation of reaction mastermix and cycling conditions are same for all the instruments listed in the product insert. For instrument specific protocols, please contact our technical support team at amplisure@raslifesciences.com**

## *Cycling conditions*

1. Configure the following program in the machine.

| Steps | No. of cycles | Temperature (°C) | Time |
|---|---|---|---|
| 1 (Initial denaturation) | 1 | 95 | 10 min |
| 2 (PCR cycling) | 40 | 95 | 15 sec. |
| | | 60* | 60 sec |
| * **Plate Read/Data Acquisition in FAM and Yakima Yellow channel** | | | |

2. Set the reaction volume as 25 µL.
3. Plate read/Data Acquisition for FAM and Yakima Yellow channel should be incorporated in the second stage of step 2 (60◦C/60 sec).
4. The ideal run time for the assay is 90 minutes. Note: *In case of Eppendorf Realplex 4, select RAMP rate as 35%.*

**Preparation of reaction mastermix and cycling conditions are same for all the instruments listed in the product insert. For instrument specific protocols, please contact our technical support team at amplisure@raslifesciences.com**

## Data Analysis

Analyze the data after completion of the run. Check the $R_n$/*Cycle* amplification plot and $\Delta R_n$/*Cycle* amplification plot to observe the amplification signal generated by different samples in the run. Compare both the plots for data analysis. Also look for noisy signals, if observed as it might not give you a proper result.

## Setting the threshold for the qPCR Data analysis

The threshold should be set either automatically (by the machine itself)/ or manually just above the background signal of the negative controls and negative samples by referring to $R_n$/*Cycle* amplification plot. The mean threshold value calculated from these experiments will most likely work for the majority of future runs, but the user should nevertheless review the generated threshold value at regular intervals.

## Result

The values for unknown samples would appear in the result column in *Ct* in FAM Channel. Samples showing no amplification in FAM channel should show amplification in Yakima Yellow channel, and then only results should be considered. The negative control should not show any value in the result column.

## Interpretation

Interpret the values for unknown samples based on the observations as described in the following table and there should be no amplification in negative control.

| Observation | Interpretation | Conclusion |
|---|---|---|
| Amplification signal detected in HSV channel (FAM) and in Internal control channel (Yakima Yellow) | HSV 1&2 DNA detected | Proceed for further Analysis |
| Amplification signal detected in HSV channel (FAM) but no signal in Internal Control channel (Yakima Yellow) | HSV 1&2 DNA detected | |

| | | |
|---|---|---|
| Amplification signal not detected in HSV channel (FAM) but detected in Internal control channel (Yakima Yellow) | HSV 1&2 DNA not detected | |
| No Amplification signal detected in HSV channel (FAM) as well as Internal control channel (Yakima Yellow) in unknown samples | Possible inhibition of PCR | Dilute the RNA sample (1:100) and repeat the assay* |

## Troubleshoot

| Observation | Possible cause | Solution |
|---|---|---|
| No amplification signal for Samples in FAM channel | 1. One of the components may not have been added.<br>2. Incorrect channel selection<br>3. Incorrect programming of the real time machine.<br>4. Instrument is not working properly | 1. Repeat the assay by following the correct protocol and addition of reagents<br>2&3. Please recheck the PCR program<br>4. Contact manufacturer of thermocycler for technical support. |
| Weak amplification signal for samples (Signal below threshold) in FAM Channel | 1. Improper PCR programming.<br>2. Inaccurate dispensing of reagents<br>3. Possible deterioration of kit components due to improper storage | 1. Repeat the assay by following the correct protocol<br>2. Minimize Pipetting errors/Check for calibration status of pipettes |
| Identical/Similar Ct values observed in FAM channel | 1. Possible contamination of Kit reagents / Quantitation Standards /Work area. | 1. Use fresh aliquots of Quantitation Standards /Kit Reagents (if available)<br>2. Clean the PCR rack/Pipettes thoroughly as per GLP<br>3. Clean and Fumigate the work area overnight prior to use |

**For any other technical query; please contact amplisure@raslifesciences.com**

## Assay Characteristics

### Analytical Sensitivity of qPCR assay

The analytical sensitivity is determined using positive clinical specimen, positive plasmid DNA control and international standards for HSV 1 and 2 i.e. Human Herpes Simplex virus type 1 and type 2 for Nucleic Acid Amplification Techniques NIBSC code: 08/224 and 08/226 respectively.

To determine the analytical sensitivity of the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit), a standard dilution series was set up from 0.1 copy /µL to 50 copies/µL and analyzed with Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit).

Testing was carried out on 10 different days on 3 replicates. The results were analyzed by statistical analysis.

**The analytical sensitivity of the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) is 1 copy/µL and 50 copies /mL when above mentioned DNA extraction kits are used.**

## Specificity

The specificity of the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) is ensured by the selection of the primers and probes, as well as the selection of stringent reaction conditions. The primers and probes were checked for possible homologies to all published sequences (Genbank) by BLAST analysis to avoid any homology with other organisms.

## Linear Range

The linear range (analytical measurement) of the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) was determined by analyzing a dilution series of HSV quantitation standards from 2 x $10^7$ copies /µL to 2 copies /µL. The assay has been tested with WHO standard for Human Herpes Simplex virus type 1 and type 2 for Nucleic Acid Amplification Techniques NIBSC code: 08/224 and 08/226 respectively.

Each dilution was tested in replicates (n = 3) using the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit).

The linear range of the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) has been determined to cover concentrations from **4 copies /µL to 2 x $10^7$ copies/µL.**

## Cross Reactivity Data

A potential cross-reactivity of the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) was tested using the control group listed below. None of the tested pathogens has been reactive. No cross-reactivity appeared with mixed infections.

Moreover, the specificity was validated with 50 different healthy plasma specimens/other various sample types. These did not generate any signals with the HSV 1&2 specific primers and probes, which are included in the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit).

| Pathogen Tested | Cross reactivity with the HSV Primers/Probes |
|---|---|
| Human DNA (Various Samples) | - |
| Dengue virus | - |
| Epstein Barr virus | - |
| Human Immunodeficiency Virus | - |
| Hepatitis B virus | - |
| Hepatitis C virus | - |
| Parvovirus | - |
| Adenovirus | - |
| Chikungunya Virus | - |
| Cytomegalovirus | - |
| Human Papilloma Virus | |
| BK Virus | - |
| *E. coli* | - |

## Precision

The precision data of the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) have been generated for HSV 1&2 positive clinical specimens and HSV quantitation standards.

## Intra-assay variability

The precision data consists of the *Intra-assay variability* which is variability of multiple results of samples of the same concentration within one experiment. The data obtained were used to determine the standard deviation and the coefficient of variation for the pathogen specific PCR. Precision data of the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) have been collected using all the quantitation standards (HSQS1- HSQS4). Also included were three different samples with different viral loads. Testing was performed with 3 replicates for 10 days.

## Inter-assay variability

The precision data consists of the *Inter-assay variability* which is variability of multiple results of samples of the same concentration within different experiments. The data obtained were used to determine the standard deviation and the coefficient of variation for the pathogen specific PCR. Precision data of the Amplisure® HSV 1&2 PCR Kit (Real Time Quantitative PCR Kit) have been collected using all the quantitation standards (HSQS1- HSQS4). Also included were three different samples with different viral loads. Testing was performed with 3 replicates for 10 days.

The precision data was calculated on basis of the Log values obtained.

| Sample Type | Mean [Log Value (copies/µL)] | Variability Testing | Standard Deviation | Coefficient of Variation (%) |
|---|---|---|---|---|
| HSQS1 | Log 5.3 | Intra-assay variability | 0.030 | 0.001 |
| | | Inter-assay variability | 0.370 | 0.017 |
| HSQS2 | Log 4.3 | Intra-assay variability | 0.040 | 0.001 |
| | | Inter-assay variability | 0.250 | 0.010 |
| HSQS3 | Log 3.3 | Intra-assay variability | 0.009 | 0.001 |
| | | Inter-assay variability | 0.250 | 0.009 |
| HSVQS4 | Log 2.3 | Intra-assay variability | 0.125 | 0.006 |
| | | Inter-assay variability | 0.170 | 0.008 |
| HSV 1&2 Control 1 | Log 3.2 | Intra-assay variability | 0.100 | 0.003 |
| | | Inter-assay variability | 0.220 | 0.007 |
| HSV 1&2 Control 2 | Log 2.2 | Intra-assay variability | 0.305 | 0.003 |
| | | Inter-assay variability | 0.412 | 0.012 |
| HSV 1&2 Control 3 | Log 1.2 | Intra-assay variability | 0.450 | 0.020 |
| | | Inter-assay variability | 0.440 | 0.021 |

## Abbreviations

| *Abbreviation* | *Expansion* |
|---|---|
| HSV | Herpes Simplex Virus |
| RNA | Ribonucleic Acid |
| IC | Internal Control |
| DNases | Deoxyribonucleases |
| PCR | Polymerase Chain Reaction |
| BSL2 | Bio Safety Level 2 |
| BSL3 | Bio Safety Level 3 |
| mL | Milli Liters |
| µL | Micro Liters |
| $K_2$EDTA | Potassium Ethylene Diamine Tetra Acetate |
| g | Relative Centrifugal Force |
| qPCR Protocol | Quantitative PCR protocol |
| MBGW | Molecular Biology Grade Water |
| RT PCR | Real Time PCR |
| NTC | No Template Control |
| FAM | Carboxyfluorescein |
| ROX | Carboxy-X-rhodamine |
| BLAST | Basic Local Alignment Search Tool |
| Sps | Species |
| Rxn | Reaction |

## References

1. Schlesinger, Y., and G. A. Storch. 1994. Herpes simplex meningitis in infancy. Pediatric Infect. Dis. J. 13:141-144
2. Cone RW, *et al*. Extended duration of HSV DNA in genital lesions detected by the polymerase chain reaction. *J Infect Dis* 1991 Oct; 164(4): 757-60.
3. Guffond T, *et al*. Significance and clinical relevance of the detection of HSV by PCR in CSF from patients with presumed encephalitis. *Clin Infect Dis* 1994 May; 18(5): 744-9.

## Ordering Information

**QT-HSV-50 : 50 rxns**
**QT-HSV-100 : 100 rxns**