

Primerdesign™ Ltd

# Vesicular stomatitis virus

Polymerase (L) gene

Genesig® Standard Kit

150 tests

GENESIG

Kits by Primerdesign

For general laboratory and research use only

# Introduction to Vesicular stomatitis virus

Vesicular stomatitis virus (VSV), often referred to as VSIV (for Vesicular stomatitis Indiana Virus), is a virus in the family *Rhabdoviridae*, which includes the well-known rabies virus. VSV is the prototypic member of its genus *Vesiculovirus* within the family *Rhabdoviridae*.

VSV can infect insects, cattle, horses and pigs. It has particular importance to farmers in certain regions of the world where it can infect cattle. This is because its clinical presentation is identical to the very important foot and mouth disease virus. (FMD)

The VSV genome consists of a linear, single-stranded, negative-sense RNA molecule of approximately 11 kb long, which encodes five genes: the nucleocapsid protein (N), phosphoprotein (P), matrix protein (M), glycoprotein (G) and polymerase (L). Two additional small proteins (C and C') are encoded in a second open reading frame within the P gene. Transcription of the viral genes occurs in sequential order from a single promoter at the 3' end of the genome resulting in decreasing amounts of each transcript in the order: 3' Le-N-P-M- G-L 5'

The virus is zoonotic and leads to a flu-like illness in infected humans. Natural VSIV infections encompass two steps, cytolitic infections of mammalian hosts and transmission by insects.

The main sign in animals is oral disease appearing as mucosal vesicles and ulcers in the mouth, but also on the udder and around the coronary band. Animals may show systemic signs such as anorexia, lethargy and pyrexia. Disease usually resolves within two weeks, and animals usually recover completely. Because the symptoms can also mimic those of foot and mouth disease, correct diagnosis is vital to avoid herd culling.

Serological testing is most commonly performed with an ELISA or complement fixation, and viral isolation can also be undertaken. Nucleotide testing of the isolated virus is the most rapid and reliable method of testing.

No specific treatment is available, but some animals may require supportive fluids or antibiotics for secondary infections. Accordingly, control relies on biosecurity protocols, quarantine, isolation and disinfection to ensure the viral disease does not enter a country or herd.

# Specificity

The Primerdesign genesig Kit for Vesicular stomatitis virus (VSV) genomes is designed for the *in vitro* quantification of VSV genomes. The kit is designed to have a broad detection profile. Specifically, the primers represent 100% homology, with over 95% of the NCBI database reference sequences available at the time of design.

The dynamics of genetic variation mean 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.

The kit targets the two major sub-types of VSV, namely Vesicular stomatitis Indiana virus and Vesicular stomatitis New Jersey virus.

If you require further information or have a specific question about the detection profile of this kit then please send an email to [enquiry@primerdesign.co.uk](mailto:enquiry@primerdesign.co.uk) and our bioinformatics team will answer your question.

# Kit contents

- **VSV-specific primer/probe mix (150 reactions BROWN)**  
FAM labelled
- **VSV positive control template (for Standard curve RED)**
- **RNase/DNase-free water (WHITE)**  
for resuspension of primer/probe mixes
- **Template preparation buffer (YELLOW)**  
for resuspension of positive control template and standard curve preparation

# Reagents and equipment to be supplied by the user

## Real-time PCR Instrument

### 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 RNA and DNA with minimal PCR inhibitors.

**oasig™ lyophilised OneStep or Precision® PLUS OneStep 2X RT-qPCR Master Mix**  
Contains complete OneStep RT-qPCR master mix

### Pipettors and Tips

### Vortex and centrifuge

### Thin-walled 0.1 ml PCR 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.

If a standard curve dilution series is prepared, this can be stored frozen for an extended period. If you see any degradation in this serial dilution, a fresh standard curve can be prepared from the positive control. 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 RNA sample with RNase/DNase-free water.

## Dynamic range of test

Under optimal PCR conditions, genesig VSV detection kits have very high priming efficiencies of >90% and can detect less than 100 copies of the 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 practise PCR. Additional information on purchasing licenses to practise 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 US Patents 5,210,015 and 5,487,972, owned by Roche Molecular Systems, Inc, and by US Patent 5,538,848, owned by The Perkin-Elmer Corporation.

## Trademarks

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The PCR process is covered by US Patents 4,683,195, and 4,683,202 and foreign equivalents owned by Hoffmann-La Roche AG. BI, ABI PRISM®, GeneAmp® and MicroAmp® are registered trademarks of the Applied Biosystems (Applied Biosystems Corporation). BIOMEK® is a registered trademark of Beckman Instruments, Inc.; iCycler™ is a registered trademark of Bio-Rad Laboratories, Rotor-Gene is a trademark of Corbett Research. LightCycler™ is a registered trademark of the Idaho Technology Inc. GeneAmp®, TaqMan® and AmpliTaqGold® are registered trademarks of Roche Molecular Systems, Inc., The purchase of the Primerdesign™ reagents cannot be construed as an authorisation or implicit license to practise PCR under any patents held by Hoffmann-LaRoche Inc.

# Principles of the test

## Real-time PCR

A VSV-specific primer and probe mix is provided, and this 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 hybridise to the VSV cDNA. A fluorogenic probe is included in the same reaction mixture, which consists 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 copy number determination and as a positive control for the PCR set-up, the kit contains a positive control template. This can be used to generate a standard curve of VSV copy number / Cq value. Alternatively, the positive control can be used at a single dilution where full quantitative analysis of the samples is not required. 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 the target VSV gene worked properly in that 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. 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 validate any positive findings, a negative control reaction should be included every time the kit is used. For this reaction, RNase/DNase-free water should be used instead of the template. A negative result indicates that the reagents have not become contaminated while setting up the run.

# Resuspension protocol

To minimise 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. Filter tips are recommended for all pipetting steps.

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

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

## 2. Resuspend the kit components in the RNase/DNase-free water supplied, according to the table below:

To ensure complete resuspension, vortex each tube thoroughly.

Component - resuspend in water	Volume
VSV primer/probe mix (BROWN)	165 µl

## 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
VSV Positive Control Template (RED) *	500 µl

\* This component contains a 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.

# OneStep RT-qPCR detection protocol

A OneStep approach combining the reverse transcription and amplification in a single closed tube is the preferred method. If, however, a two-step approach is required, see page 10.

## For optimum performance and sensitivity.

All pipetting steps and experimental plate set-up should be performed on ice. After the plate is poured proceed immediately to the OneStep amplification protocol. Prolonged incubation of reaction mixes at room temperature can lead to PCR artifacts that reduce the sensitivity of detection.

### 1. For each RNA sample, prepare a reaction mix according to the table below:

Include sufficient reactions for positive and negative controls.

Component	Volume
oasig OneStep or PrecisionPLUS OneStep 2X RT-qPCR Master Mix	10 $\mu$ l
VSV primer/probe mix (BROWN)	1 $\mu$ l
RNase/DNase-free water (WHITE)	4 $\mu$ l
<b>Final Volume</b>	<b>15 <math>\mu</math>l</b>

### 2. Pipette 15 $\mu$ l of this mix into each well according to your qPCR experimental plate set-up.

### 3. Pipette 5 $\mu$ l of RNA template into each well, according to your experimental plate set-up.

For negative control wells, use 5  $\mu$ l of RNase/DNase free water. The final volume in each well is 20  $\mu$ l.

### 4. If a standard curve is included for quantitative analysis, prepare a reaction mix according to the table below:

Component	Volume
oasig OneStep or PrecisionPLUS OneStep 2X RT-qPCR Master Mix	10 $\mu$ l
VSV primer/probe mix (BROWN)	1 $\mu$ l
RNase/DNase-free water (WHITE)	4 $\mu$ l
<b>Final Volume</b>	<b>15 <math>\mu</math>l</b>



## 5. Preparation of standard curve dilution series

- Pipette 90 µl of template preparation buffer into 5 tubes and label 2-6
- Pipette 10 µl of Positive Control Template (**RED**) into tube 2
- Vortex thoroughly
- Change pipette tip and pipette 10 µl from tube 2 into tube 3
- Vortex thoroughly

Repeat steps d and e to complete the dilution series.

Standard Curve	Copy Number
Tube 1 Positive control ( <b>RED</b> )	2 x 10 <sup>5</sup> per µl
Tube 2	2 x 10 <sup>4</sup> per µl
Tube 3	2 x 10 <sup>3</sup> per µl
Tube 4	2 x 10 <sup>2</sup> per µl
Tube 5	20 per µl
Tube 6	2 per µl

## 6. Pipette 5 µl of the standard template into each well for the standard curve according to your plate set-up

The final volume in each well is 20 µl.

# OneStep RT-qPCR amplification protocol

Amplification conditions using oasig OneStep or PrecisionPLUS OneStep 2X RT-qPCR Master Mix.

	Step	Time	Temp
	Reverse Transcription	10 min	55 °C
	Enzyme activation	2 min	95 °C
Cycling x50	Denaturation	10 s	95 °C
	<b>DATA COLLECTION *</b>	60 s	60 °C

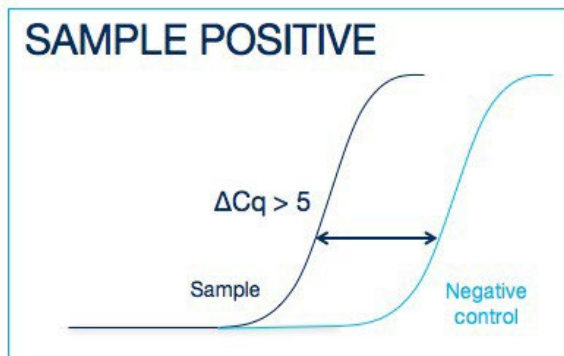
\* Fluorogenic data should be collected during this step through the FAM channel

# Interpretation of results

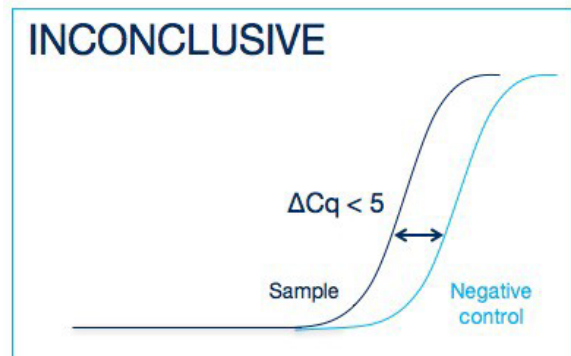
Target	Positive control	Negative control	Interpretation
+	+	-	<b>POSITIVE QUANTITATIVE RESULT</b> calculate copy number
-	+	-	<b>NEGATIVE RESULT</b>
+ / -	+	≤ 35	<b>EXPERIMENT FAILED</b> due to test contamination
+ / -	+	> 35	*
+ / -	-	+ / -	<b>EXPERIMENT FAILED</b>

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.