

PrimePCR™ Assay Validation Report

Gene Information

Gene Name	sonic hedgehog
Gene Symbol	SHH
Organism	Human
Gene Summary	<p>This gene encodes a protein that is instrumental in patterning the early embryo. It has been implicated as the key inductive signal in patterning of the ventral neural tube the anterior-posterior limb axis and the ventral somites. Of three human proteins showing sequence and functional similarity to the sonic hedgehog protein of Drosophila this protein is the most similar. The protein is made as a precursor that is autocatalytically cleaved; the N-terminal portion is soluble and contains the signalling activity while the C-terminal portion is involved in precursor processing. More importantly the C-terminal product covalently attaches a cholesterol moiety to the N-terminal product restricting the N-terminal product to the cell surface and preventing it from freely diffusing throughout the developing embryo. Defects in this protein or in its signalling pathway are a cause of holoprosencephaly (HPE) a disorder in which the developing forebrain fails to correctly separate into right and left hemispheres. HPE is manifested by facial deformities. It is also thought that mutations in this gene or in its signalling pathway may be responsible for VACTERL syndrome which is characterized by vertebral defects anal atresia tracheoesophageal fistula with esophageal atresia radial and renal dysplasia cardiac anomalies and limb abnormalities. Additionally mutations in a long range enhancer located approximately 1 megabase upstream of this gene disrupt limb patterning and can result in preaxial polydactyly.</p>
Gene Aliases	HHG1, HLP3, HPE3, MCOPCB5, SMMCI, TPT, TPTPS
RefSeq Accession No.	NC_000007.13, NG_007504.1, NT_007741.14
UniGene ID	Hs.164537
Ensembl Gene ID	ENSG00000164690
Entrez Gene ID	6469

Assay Information

Unique Assay ID	qHsaCED0037736
Assay Type	SYBR® Green
Detected Coding Transcript(s)	ENST00000297261, ENST00000430104
Amplicon Context Sequence	TGCTGCGGTCGCGGTCAGACGTGGTGGTATGTCCACTGCGCGGCCCTCGTAGTGC AGAGACTCCTCTGAGTGGTGGCCATCTTCGTCCCAGCCCTCGGTCACCCGCAGT TTCACCTCTGGCCACTGGTTCATCACCGAGATGGCCAAAGCGTTCAACTTGTCTT TACACCTCTGAGTCATCAGC
Amplicon Length (bp)	151
Chromosome Location	7:155599083-155604529
Assay Design	Exonic

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Purification	Desalted
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Validation Results

Efficiency (%)	95
R ²	0.9998
cDNA Cq	24.42
cDNA Tm (Celsius)	88
gDNA Cq	25.33
Specificity (%)	100

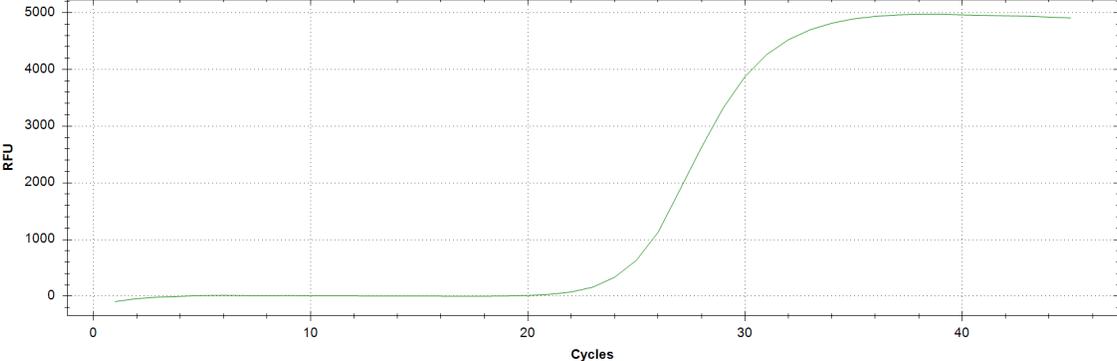
Information to assist with data interpretation is provided at the end of this report.

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SHH, Human

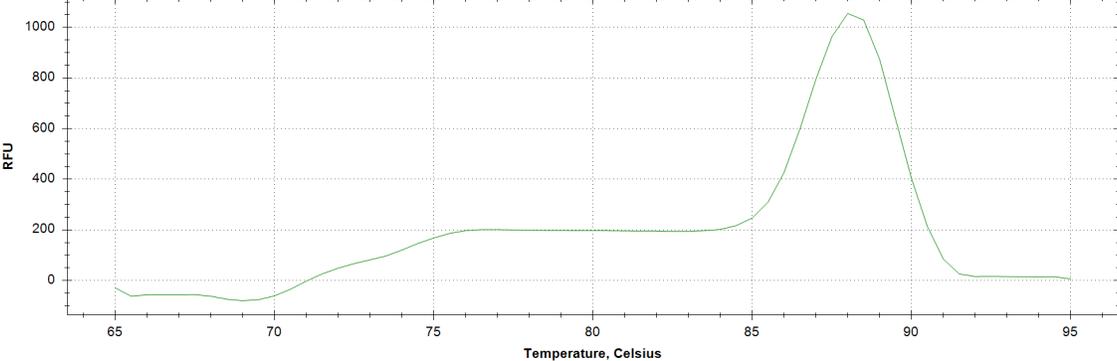
Amplification Plot

Amplification of cDNA generated from 25 ng of universal reference RNA



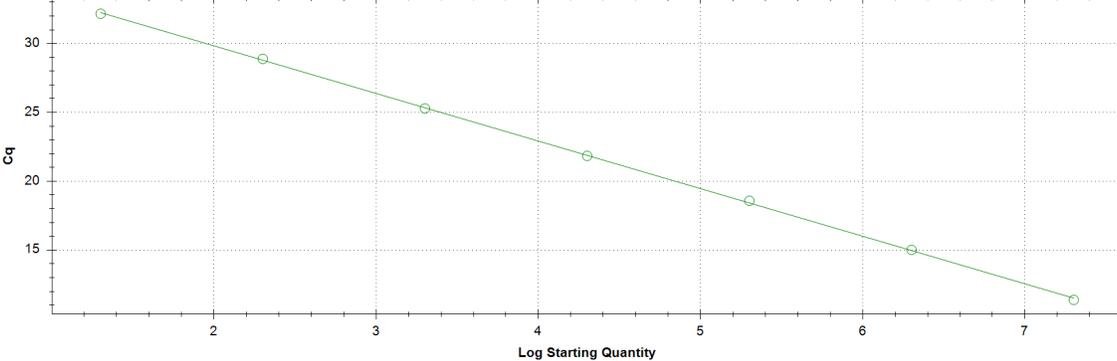
Melt Peak

Melt curve analysis of above amplification



Standard Curve

Standard curve generated using 20 million copies of template diluted 10-fold to 20 copies



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Products used to generate validation data

Real-Time PCR Instrument	CFX384 Real-Time PCR Detection System
Reverse Transcription Reagent	iScript™ Advanced cDNA Synthesis Kit for RT-qPCR
Real-Time PCR Supermix	SsoAdvanced™ SYBR® Green Supermix
Experimental Sample	qPCR Human Reference Total RNA

Data Interpretation

Unique Assay ID	This is a unique identifier that can be used to identify the assay in the literature and online.
Detected Coding Transcript(s)	This is a list of the Ensembl transcript ID(s) that this assay will detect. Details for each transcript can be found on the Ensembl website at www.ensembl.org .
Amplicon Context Sequence	This is the amplicon sequence with additional base pairs added to the beginning and/or end of the sequence. This is in accordance with the minimum information for the publication of real-time quantitative PCR experiments (MIQE) guidelines. For details, please refer to the following publication, "Primer Sequence Disclosure: A Clarification of the MIQE Guidelines" (Bustin et al 2011).
Chromosome Location	This is the chromosomal location of the amplicon context sequence within the genome.
Assay Design	<p>Exonic: Primers sit within the same exon in the mRNA transcript and can potentially co-amplify genomic DNA. If performing gene expression analysis, it is suggested that the samples be treated with a DNase to eliminate potential unwanted signal from contaminating genomic DNA.</p> <p>Exon-exon junction: One primer sits on an exon-exon junction in mRNA. When performing gene expression analysis, this design approach will prevent unwanted signal from contaminating genomic DNA.</p> <p>Intron-spanning: Primers sit within different exons while spanning a large intron in the mRNA (intron is greater than 750bp). When performing gene expression analysis, this design approach should limit potential unwanted signal from contaminating genomic DNA.</p> <p>Small intron-spanning: Primers sit within different exons with a short intron in between (intron is smaller than 750bp). Small introns may not prevent unwanted signal from contaminating genomic DNA.</p>
Efficiency	Assay efficiency was determined using a seven-point standard curve from 20 copies to 20 million copies. While an efficiency of 100% represents a perfect doubling of template at every cycle and is ideal, typical ranges of good assay efficiency are between 90-110%. For difficult targets, assay efficiency outside of this range are accepted and reported accordingly.
R²	The R ² represents the linearity of the standard curve and how well the standard curve data points fit the linear regression line. Acceptable values are >0.98.

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cDNA Cq	<p>Cq value obtained from 25ng of cDNA transcribed from universal RNA when performing wet-lab validation of the assay.</p> <p>Note: Not all genes will be expressed at a detectable level in the universal RNA sample.</p>
cDNA Tm	<p>Melting temperature of the amplicon when running a melt curve analysis.</p>
gDNA Cq	<p>Cq value obtained when running the assay with 2.5ng of genomic DNA. This is more than a moderate level of genomic DNA contamination. Intron-spanning and exon-exon junction assay designs can minimize or eliminate genomic DNA detection.</p> <p>Note: Genomic DNA contamination is often present at variable levels. If concerned about genomic DNA contamination, the genomic DNA contamination control assay is recommended to run with your sample to determine if genomic DNA levels are sufficient to negatively impact results.</p>
Specificity	<p>This value is the percent of specific amplicon reads as measured by next generation sequencing (NGS). While 100% specificity is desirable, small decreases in specificity (<1%) can be due to NGS read errors. More significant reductions are likely due to co-amplification of homologous regions.</p> <p>Note: Since gene expression can be cell type and condition specific, the exact level and impact of co-amplification in a given sample is impossible to predict. If co-amplification is detected, it should be taken into consideration and reported when analyzing gene expression results.</p>