

ViroReal[®] Kit CAEV

Manual

For use with the

- Applied Biosystems[®] 7500 (Fast)
- Mx3005P[®]
- LightCycler[®] 480



For veterinary use only

REF

DVEV03411, DVEV03413



100

REF

DVEV03451, DVEV03453



50



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1. Product description

ViroReal[®] Kit CAEV is a real-time PCR kit for the detection of caprine arthritis - encephalitis virus (CAEV) using one-step reverse transcription real-time PCR. This test was developed for the Applied Biosystems[®] 7500 (Fast) instrument (Thermo Fisher Scientific), but is also suitable for other real-time PCR instruments. This test allows the rapid and sensitive detection of CAEV RNA purified from blood (mononuclear cells, PBMC) (e.g. with the QIAamp Viral RNA Mini Kit, Qiagen).

ViroReal[®] Kit CAEV detects the gag polyprotein gene. A probe-specific amplification-curve at 530 nm (FAM channel) indicates the amplification of CAEV specific RNA.

An internal RNA positive control system for detection in VIC/HEX channel (order no. DVEV03411 or DVEV03451) or in Cy5 channel (order no. DVEV03413 or DVEV03453) allows control of RNA extraction and excludes false-negative interpretation of results due to inhibition of reverse transcription real-time PCR (see 8. Interpretation of PCR-data).

When using PCR-platforms not validated by ingenetix, an evaluation of the multiplex-PCR is recommended. Please be aware that some PCR-platforms have to be calibrated with the corresponding dye before performing multiplex-PCR.

BactoReal[®], MycoReal, ParoReal and ViroReal[®] Kits are optimized to run under the same thermal cycling conditions. RNA and DNA material can be analysed in one run.

2. Pathogen information

The caprine arthritis - encephalitis virus (CAEV) of goats is an enveloped, single-stranded RNA small ruminant lentivirus (SRLV) in the family *Retroviridae*. There are several, genetically distinct isolates of the virus that differ in virulence. The CAE-virus is closely related to the Maedi-Visna virus (MVV) of sheep. Both infect cells of the monocyte/macrophage lineage and cause lifelong infections. Transmission of the CAEV is through ingestion of virus-infected goat milk but also through virus-infected secretion of affected animals and droplet infection. Clinical symptoms such as severe arthritis of the carpal joint are seen in approximately 20 % of infected goats. Subclinical or clinical interstitial pneumonia, mastitis with lower milk production and chronic wasting have also been attributed to infection with the virus.

References:

H. Ramirez et al. 2013. Small ruminant lentiviruses: genetic variability, tropism and diagnosis. *Viruses* 5(4): 1175-1207.

3. Principle of real-time PCR

When detecting pathogens by reverse transcription real-time PCR, a specific RNA sequence of the pathogen genome is transcribed into cDNA and amplified. The generated PCR-product is detected by an oligonucleotide-probe labelled with a fluorescent dye. This technology allows for a sequence-specific detection of PCR amplicates.

4. General Precautions

- Always include a negative control per PCR-run (Nuclease-free water instead of sample).
- Optional: for valid interpretation of results, a negative control should be included during RNA-extraction (for example extraction of water instead of sample material), in order to exclude false-positive results due to contamination with CAEV RNA during extraction.
- Be careful when handling the positive control.
- Store and extract positive material (specimens, controls and amplicons) separately from all other reagents and add it to the reaction mix in a spatially separated workspace.
- Periodically decontaminate benches and devices.
- Use sterile pipette tips with filters.
- Thaw all components thoroughly at room temperature before starting an assay. When thawed, mix the components and centrifuge briefly.
- Always keep the RNA Reaction Mix on ice.
- Use the RNA immediately after extraction and store at -20°C to -80°C as soon as possible.
- **Caution:** the Positive Control and the RNA IPC Target are stored in RNA stabilizer that contains Guanidinium thiocyanate/Triton X-100 (see MSDS, www.ingenetix.com).

5. Contents of the Kit

5.1. ViroReal[®] Kit CAEV order no. DVEV03411 or DVEV03451

Labelling	Content	Amount		Storage
		DVEV03411	DVEV03451	
CAEV Assay Mix (green cap)	Primer and probe (FAM) for CAEV detection	2 x 50 µl	1 x 50 µl	-15 °C to -25 °C
RNA IPC-1 Assay Mix (yellow cap)	Primer and probe (VIC/HEX) for RNA IPC detection	2 x 50 µl	1 x 50 µl	-15 °C to -25 °C
RNA IPC Target (orange cap)	RNA internal positive control	1 x 100 µl	1 x 100 µl	-15 °C to -25 °C
CAEV Positive Control (red cap)	RNA positive control	1 x 15 µl	1 x 15 µl	-15 °C to -25 °C
RNA Reaction Mix (white cap)	Amplification mix for one-step RT real-time PCR	2 x 250 µl	1 x 250 µl	-15 °C to -25 °C
Nuclease-free water (blue cap)	Nuclease-free water	2 x 1000 µl	1 x 1000 µl	-15 °C to -25 °C

5.2. ViroReal[®] Kit CAEV order no. DVEV03413 or DVEV03453

Labelling	Content	Amount		Storage
		DVEV03413	DVEV03453	
CAEV Assay Mix (green cap)	Primer and probe (FAM) for CAEV detection	2 x 50 µl	1 x 50 µl	-15 °C to -25 °C
RNA IPC-3 Assay Mix (yellow cap)	Primer and probe (Cy5) for RNA IPC detection	2 x 50 µl	1 x 50 µl	-15 °C to -25 °C
RNA IPC Target (orange cap)	RNA internal positive control	1 x 100 µl	1 x 100 µl	-15 °C to -25 °C
CAEV Positive Control (red cap)	RNA positive control	1 x 15 µl	1 x 15 µl	-15 °C to -25 °C
RNA Reaction Mix (white cap)	Amplification mix for one-step RT real-time PCR	2 x 250 µl	1 x 250 µl	-15 °C to -25 °C
Nuclease-free water (blue cap)	Nuclease-free water	2 x 1000 µl	1 x 1000 µl	-15 °C to -25 °C

The components of ViroReal[®] Kit CAEV are stable until the expiry date stated on the label. Repeated thawing and freezing should be avoided. Please protect kit components from light.

6. Additionally required materials and devices

- Reagents and devices for RNA-extraction
- Nuclease-free water for dilution of RNA IPC Target and positive control
- Disposable powder-free gloves
- Pipettes (adjustable)
- Sterile pipette tips with filters
- Vortex mixer
- Desktop centrifuge with rotor for 2 ml reaction tubes
- Real-time PCR instrument which is able to detect and differentiate fluorescence in FAM and VIC/HEX or Cy5 channel
- Appropriate 96 well reaction plates or reaction tubes with corresponding (optical) closing material

7. Preparation of real-time PCR

Please make sure that at least one negative control (water, blue cap), as well as one positive control (red cap) and one extraction negative control (optional, recommended) are included per PCR run.

Ingenetix highly recommends performing PCR analyses in duplicates, which increases the probability of detection of the pathogen and facilitates interpretation of results.

- Prepare master mix on ice.
- Thaw RNA Reaction Mix on ice, and invert 2 to 3 times to ensure homogenous solution. Do not let it warm to room temperature.
- Use RNA immediately after extraction and store at -20 to -80°C as soon as possible.

7.1. Internal RNA positive control (RNA IPC)

An internal RNA positive control system containing the RNA IPC assay and the RNA IPC Target excludes false-negative interpretation of results due to inhibition of reverse transcription real-time PCR.

→ Dilute RNA IPC Target freshly 1:500 with nuclease-free water and add to the master mix (use 1 µl/reaction).

→ Alternatively, for control of RNA extraction and PCR inhibition the RNA IPC Target can be added during extraction.

Spike 1 µl of undiluted RNA IPC Target into the sample material after the lysis buffer was added. Caution: Do not add the RNA IPC Target directly to the sample material.

7.2. Positive Control

The CAEV Positive Control is an *in vitro* synthesized RNA in RNA-stabilizer. It has to be stored at -20°C. Before use it has to be freshly diluted 1:500 with nuclease-free water, which corresponds to approx. 40,000 target copies/µl.

→ As positive control use 1 µl of the freshly 1:500 diluted CAEV Positive Control + 9 µl nuclease-free water.

Caution: The use of more than 1 µl positive control (diluted 1:500) inhibits the RT-PCR reaction.

7.3. Pipetting scheme

		Per sample
Preparation of Master Mix (mix well)	Nuclease-free Water*	2.0 µl
	RNA Reaction Mix	5.0 µl
	CAEV Assay Mix	1.0 µl
	RNA IPC Assay Mix	1.0 µl
	RNA IPC Target [#] (freshly diluted 1:500)	1.0 µl
	Total volume Master Mix	10.0 µl
Preparation of PCR	Master Mix	10.0 µl
	RNA-Sample*	10.0 µl
	Total volume	20.0 µl

*1-10 µl of the sample can be used. When using an amount < 10 µl of the sample, the amount of H₂O has to be changed accordingly.

[#]If RNA IPC Target not already added during extraction.

7.4. Programming of the temperature profile

Please find further information on programming the real-time PCR instrument in the respective operator's manual. Please be aware that some PCR-platforms have to be calibrated with the corresponding dye before performing multiplex-PCR.

Select dyes: FAM-TAMRA for detection of CAEV

Cy5-NONE (RNA IPC-3 Assay Mix) or

VIC/HEX-TAMRA (RNA IPC-1 Assay Mix) for detection of RNA IPC

Select reference dye (passive reference): ROX

Sample Volume: 20 µl

Temperature Profile:

Program 1	Program 2	Program 3
Cycles: 1 Analysis: None	Cycles: 1 Analysis: None	Cycles: 45 Analysis: Quantification Acquisition at 60°
50°C 15 min	95°C 20 sec	95°C 5 sec 60°C 1 min

For Applied Biosystems® 7500:
Ramp speed: Without "fast cycling" parameter

For LightCycler® 480 instrument:
Detection format: 2 Color Hydrolysis Probe
(dyes see above)

Note: These instrument parameters can be used for all BactoReal®, MycoReal, ParoReal and ViroReal® kits on all PCR instruments.

8. Interpretation of PCR-data

For a valid interpretation, the following criteria must be fulfilled:

	Ct/Cp (FAM channel) CAEV target	Ct/Cp RNA IPC target	Interpretation
Negative control	Negative	26-29*	Valid
Positive control (freshly diluted 1:500), approx. 40,000 copies, 1 µl/PCR	24-27	26-29*	Valid
Extraction negative control (optional)	Negative	26-29	Valid
Negative sample	Negative	26-29	Valid
Positive sample	Positive	26-29/negative	Valid

*In the case that the RNA IPC target has been added to the master mix

For analysis of PCR data please proceed as follows:

For analysis of PCR results gained with ViroReal® Kit CAEV please select fluorescence display options FAM channel for the CAEV target and VIC/HEX channel (order no. DVEV03411, DVEV03451) or Cy5 channel (order no. DVEV03413, DVEV03453) for the internal RNA positive control target (RNA IPC). Samples with a positive Cp or Ct-value are considered positive. Please also check amplification-curves and, if necessary, adjust threshold manually.

8.1. Signal in FAM channel

→ RNA of CAEV was amplified. The sample has to be interpreted as positive.
CAEV RNA can lead to a reduced or absent fluorescence signal of the RNA IPC.

8.2. No signal in FAM channel but signal of the RNA IPC

→ No CAEV RNA is detectable in the sample. The sample has to be interpreted as negative.
The positive signal of the RNA IPC assay excludes a putative PCR inhibition.

8.3. No signal in FAM channel and no signal with the RNA IPC

→ No interpretation statement can be made.

Information about possible sources of error and their solution can be found in 9. Troubleshooting.

9. Troubleshooting

9.1. No CAEV specific signal with positive control

- Incorrect programming of the temperature profile of the real-time PCR instrument.
→ Compare the temperature profile with the protocol (see 7. Preparation of real-time PCR).
- Incorrect configuration of the PCR reaction.
→ Check your work steps (see 7. Preparation of real-time PCR) and repeat the PCR, if necessary.

9.2. No signal with the RNA IPC and no CAEV specific signal with sample

- The PCR reaction was inhibited. No interpretation can be made.
→ Make sure that you use a recommended method for RNA isolation and stick closely to the manufacturer's instructions.
→ If no operating mistakes during extractions can be retraced, it is recommended to repeat the PCR with lower amounts of RNA-eluate (1/5 or 1/10 of sample volume + the adequate amount of H₂O).
- Incorrect PCR conditions.
→ Check the PCR conditions and repeat the PCR, if necessary.

9.3. CAEV specific signal with negative control

- A contamination occurred during preparation of the PCR.
→ Repeat PCR with new reagents in replicates.
→ Strictly pipette the positive controls at last.
→ Make sure that workspace and instruments are decontaminated at regular intervals.

9.4. CAEV specific signal with negative control of RNA-extraction (optional)

- A contamination occurred during extraction.
→ Repeat the extraction and PCR using new reagents.
→ Make sure that workspace and instruments are decontaminated at regular intervals.

10. Specifications and performance evaluation

ViroReal[®] Kit CAEV was evaluated with the Applied Biosystems[®] 7500 (Fast) instrument (Thermo Fisher Scientific). For further validation data please contact ingenetix GmbH.

10.1. Analytical sensitivity and linearity

ViroReal[®] Kit CAEV was tested with a 10-fold dilution series of a synthetic RNA representing a fragment of CAEV RNA. At least 100 target copies/reaction could be detected.

The assay shows **linearity** over the range of 100 to 10,000,000 target copies/reaction with a slope of -3.7 and a R₂ of > 0.99 as shown in Figure 1.

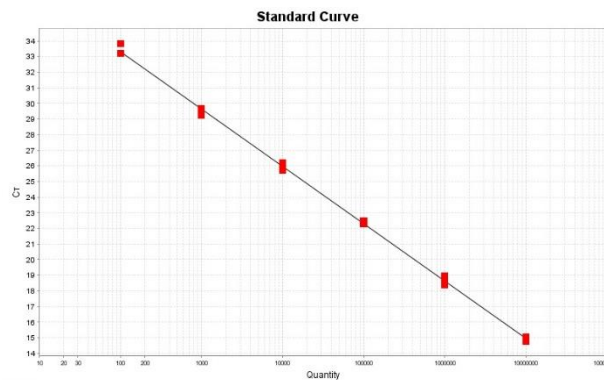


Figure 1 Ten-fold dilution series of a CAEV RNA standard plotted against CT

10.2. Analytical specificity

The specificity is ensured by the selection of highly specific primers and probe. The primers and probe were checked for possible homologies to currently published sequences by sequence comparison analyses. This also validated the detection of so far known CAEV strains.

10.3. Kit performance

Performance of ViroReal[®] Kit CAEV with an Applied Biosystems[®] 7500 (Fast) instrument (Thermo Fisher Scientific) is shown in Figure 2.

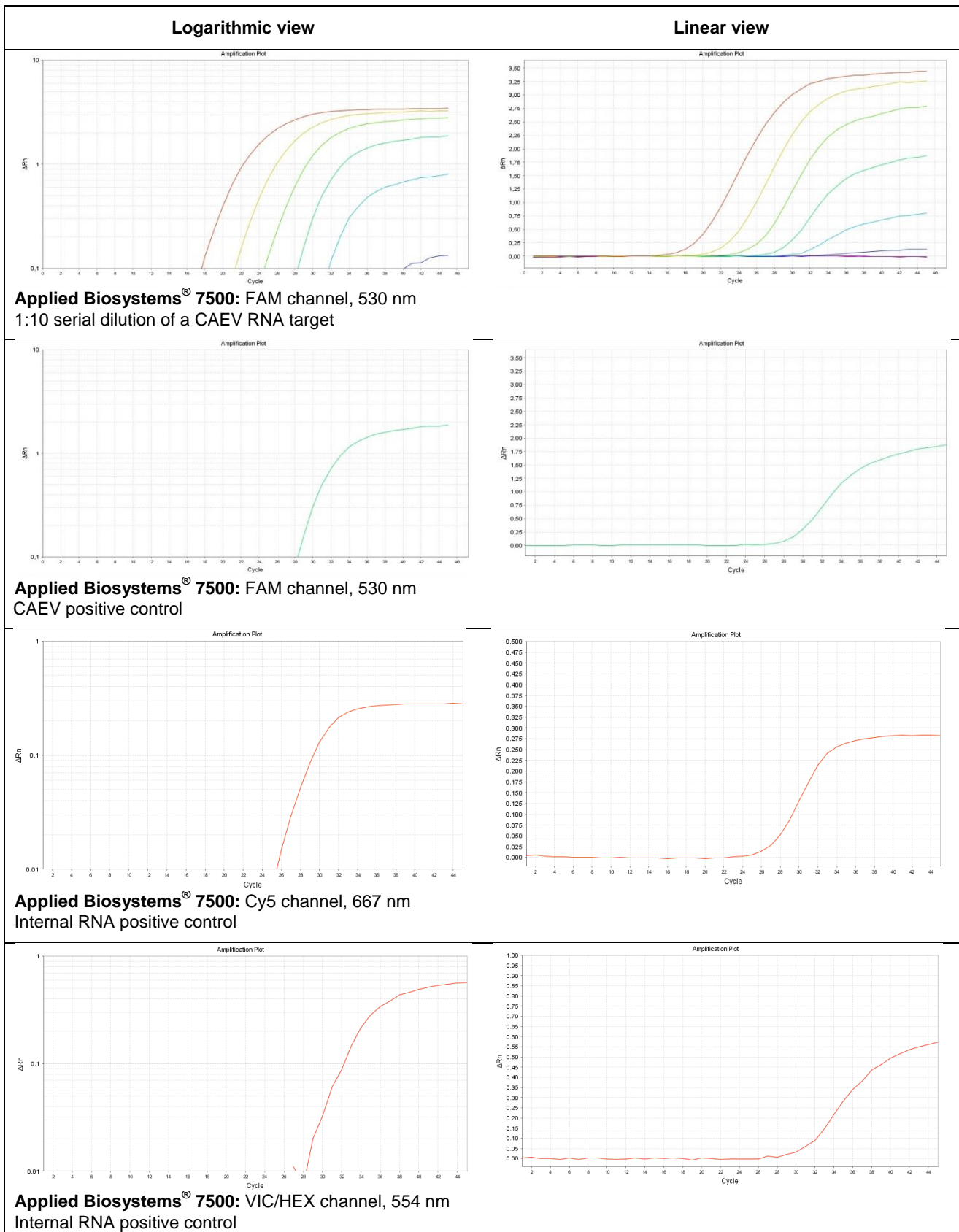


Figure 2 Performance of ViroReal® Kit CAEV

11. Annex – symbols



Batch code



Catalogue number



Contains sufficient for <n> tests



Use by



Manufactured by



Store at