

BactoReal[®] Kit *Salmonella enterica*

Manual

For use with the

- ABI PRISM[®] 7500 (Fast)
- Mx3005P[®]
- LightCycler[®] 480



For veterinary use only

REF DVEB02311, DVEB02313

Σ 100

REF DVEB02351, DVEB02353

Σ 50



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Index

1. Product description	3
2. Pathogen information	3
3. Principle of real-time PCR	3
4. General Precautions	3
5. Contents of the Kit	4
5.1. BactoReal® Kit <i>Salmonella enterica</i> order no. DVEB02311 or DVEB02351	4
5.2. BactoReal® Kit <i>Salmonella enterica</i> order no. DVEB02313 or DVEB02353	4
6. Additionally required materials and devices	4
7. Preparation of real-time PCR	5
7.1. Pipetting scheme	5
7.2. Programming of the temperature profile	5
8. Interpretation of PCR-data	6
8.1. Signal in FAM channel:	6
8.2. No signal in FAM channel:	6
8.3. No signal in FAM channel but signal of the internal positive control (optional):	6
8.4. No signals in FAM channel and no signal with internal positive control (optional):	6
9. Troubleshooting	8
9.1. No <i>Salmonella enterica</i> specific signal with positive control	8
9.2. No signal with IPC and no <i>Salmonella enterica</i> specific signal with sample	8
9.3. <i>Salmonella enterica</i> specific signal with negative control	8
9.4. <i>Salmonella enterica</i> specific signal with negative control of DNA-extraction	8
10. Specifications	8
10.1. Analytical sensitivity	8
10.2. Analytical specificity	8
11. Annex – symbols	8

1. Product description

BactoReal® Kit *Salmonella enterica* is a real-time PCR assay for detection of *Salmonella enterica* DNA. This test was developed and validated for the ABI PRISM® 7500 (Fast) instrument (Thermo Fisher Scientific), LightCycler® 480 (Roche), and for Mx3005P® (Agilent) but is also suitable for other real-time PCR instruments. This test allows the rapid and sensitive detection of DNA of *Salmonella enterica* from samples purified from swabs, feces, etc. (e.g. with the QIAamp DNA Mini Kit or the QIAamp DNA Stool Mini Kit).

BactoReal® Kit *Salmonella enterica* detects the invasion protein A (invA) gene of *Salmonella enterica*. The invA gene is essential for full virulence in *Salmonella* and is specific for members of the genus *Salmonella*. A probe-specific amplification-curve at 530 nm (FAM channel) indicates the amplification of *Salmonella enterica* specific DNA.

An internal positive control system for detection in VIC/HEX channel, (554 nm, order no. DVEB02311 or DVEB02351) or Cy5 channel (667 nm; order no. DVEB02313 or DVEB02353) excludes false-negative interpretation of results due to inhibition of 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

Salmonella is a genus of Gram-negative bacteria of the *Enterobacteriaceae* family. This genus consists of only two species, *Salmonella enterica* and *Salmonella bongori*. *Salmonella bongori* mostly infects cold blooded animals. *Salmonella enterica* has six subspecies and more than 2500 serovars. Subspecies are *S. enterica* subsp. *arizonae*, *S. enterica* subsp. *diarizonae*, *S. enterica* subsp. *enterica*, *S. enterica* subsp. *houtenae*, *S. enterica* subsp. *indica* and *S. enterica* subsp. *salamae*. *Salmonella* infections in warm-blooded animals are generally caused by strains from *S. enterica* subspecies *enterica*. Typhoidal serovars include *Salmonella* Typhi and *Salmonella* Paratyphi, which only infect humans. Nontyphoidal serovars are more common, and usually cause self-limiting gastrointestinal disease. They can infect a range of animals, and are zoonotic. Although many other *Salmonella* serovars may cause enteric disease, the more common ones in cattle are *Salmonella* Typhimurium, *Salmonella* Dublin and *Salmonella* Newport. In sheep and goat the most common are *Salmonella* Typhimurium, *Salmonella* Dublin, *Salmonella* Abortusovis, *Salmonella* Anatum and *Salmonella* Montevideo. In pigs the most common are *Salmonella* Typhimurium and *Salmonella* Choleraesuis, and in poultry *Salmonella* Enteritidis, *Salmonella* Typhimurium, *Salmonella* Gallinarum and *Salmonella* Pullorum.

3. Principle of real-time PCR

A specific DNA sequence of the pathogen genome is amplified and 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

The user should always pay attention to the following:

- Always include a negative control per PCR-run (water instead of sample).
- Optional: for valid interpretation of results, a negative control should be included during DNA-extraction (for example extraction of water instead of sample material), in order to exclude false-positive results due to contamination with *Salmonella enterica* DNA 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 and 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.
- For MSDS, see www.ingenetix.com.

5. Contents of the Kit

5.1. BactoReal® Kit *Salmonella enterica* order no. DVEB02311 or DVEB02351

Labelling	Content	Amount		Storage
		DVEB02311	DVEB02351	
Salmonella Assay Mix (green cap)	Primer and probe (FAM) for detection of <i>S. enterica</i>	2 x 50 µl	1 x 50 µl	-20°C
CR-1 Assay Mix (yellow cap)	Primer, probe (VIC/HEX) and target for detection of IPC	2 x 50 µl	1 x 50 µl	-20°C
Salmonella Positive Control (red cap)	Control-DNA (approx. 10,000 target copies/µl)	1 x 25 µl	1 x 25 µl	-20°C
DNA Reaction Mix (white cap) [#]	Reaction Mix	2 x 500 µl	1 x 500 µl	-20°C until first use, then at +4°C
Water (blue cap)	Water	1 x 1000 µl	1 x 1000 µl	-20°C to +4°C

[#]DNA Reaction Mix contains uracil-N glycosylase (UNG)

5.2. BactoReal® Kit *Salmonella enterica* order no. DVEB02313 or DVEB02353

Labelling	Content	Amount		Storage
		DVEB02313	DVEB02353	
Salmonella Assay Mix (green cap)	Primer and probe (FAM) for detection of <i>Salmonella</i>	2 x 50 µl	1 x 50 µl	-20°C
CR-3 Assay Mix (yellow cap)	Primer, probe (Cy5) and target for detection of IPC	2 x 50 µl	1 x 50 µl	-20°C
Salmonella Positive Control (red cap)	Control-DNA (approx. 10,000 target copies/µl)	1 x 25 µl	1 x 25 µl	-20°C
DNA Reaction Mix (white cap) [#]	Reaction Mix	2 x 500 µl	1 x 500 µl	-20°C until first use, then at +4°C
Water (blue cap)	Water	1 x 1000 µl	1 x 1000 µl	-20°C to +4°C

[#]DNA Reaction Mix contains uracil-N glycosylase (UNG)

The components of BactoReal® Kit *Salmonella enterica* 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 DNA-extraction
- PCR-grade water
- 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.

7.1. Pipetting scheme

		Per sample
Preparation of Master Mix (mix well)	Water*	3.0 µl
	DNA Reaction Mix (2x)	10.0 µl
	Salmonella Assay Mix	1.0 µl
	CR Assay Mix	1.0 µl
	Total volume Master Mix	15.0 µl
Preparation of PCR assay	Master mix	15.0 µl
	Sample*	5.0 µl
	Total volume	20.0 µl

*1-8 µl of the sample can be used. When using an amount other than 5 µl of the sample, the amount of H₂O has to be changed accordingly.

Positive Control: As positive control please use 1 µl of the *Salmonella* Positive Control + 4 µl H₂O.

Optional: a 1:10 dilution of the positive control can be used and defined as second standard value (approx. 1000 target copies/µl).

7.2. 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 *Salmonella enterica*

Cy5-NONE (CR-3 Assay Mix) or VIC-TAMRA (CR-1 Assay Mix) for detection of 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 2 min*	95°C 20 sec	95°C 5 sec
		60°C 1 min

For ABI PRISM® 7500:

Ramp speed: Without "fast cycling" parameter

For LightCycler® 480 instrument:

Detection format: 2 Color Hydrolysis Probe (dyes see above)

***Note:** If viral RNA should be also detected in the same PCR run, program 1 has to be prolonged to 15 min at 50°C. This temperature profile can be used for all BactoReal®, MycoReal, ParoReal and ViroReal® kits for the detection of DNA or RNA.

8. Interpretation of PCR-data

Examples for interpretation of positive reactions are shown in the amplification plots below.

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

	Ct/Cp (FAM channel) <i>Salmonella enterica</i> target	Ct/Cp IPC target	Interpretation
Negative control	Negative	36.0 ± 2	Valid
Positive control (undiluted, 1 µl/PCR)	28.0-31.0	36.0 ± 2	Valid
Or: positive control (1:10 diluted, 1 µl/PCR)	31.0-34.0	36.0 ± 2	Valid
Extraction negative control (optional)	Negative	36.0 ± 2	Valid
Negative sample	Negative	36.0 ± 2	Valid
Positive sample	Positive	Positive/Negative	Valid

For analysis of PCR data please proceed as follows:

For analysis of PCR results gained with BactoReal® Kit *Salmonella enterica* please select fluorescence display options FAM channel for the *Salmonella enterica* target and VIC/HEX channel (order no. DVEB02311, DVEB02351) or Cy5 channel (order no. DVEB02313, DVEB02353) for the internal positive control target. Samples with a positive Cp or Ct-value are considered positive. Please also check the presence of amplification-curves manually.

8.1. Signal in FAM channel:

→ DNA of *Salmonella enterica* was amplified. The sample has to be interpreted as positive.

Salmonella DNA can lead to a reduced or absent fluorescence signal of the internal positive control (competition of PCR).

8.2. No signal in FAM channel:

→ No *Salmonella enterica* DNA is detectable in the sample. The sample has to be interpreted as negative. An inhibition of PCR cannot be excluded.

8.3. No signal in FAM channel but signal of the internal positive control (optional):

→ No *Salmonella enterica* DNA is detectable in the sample. The sample has to be interpreted as negative. The positive signal of the internal positive control assay excludes a putative PCR inhibition.

8.4. No signals in FAM channel and no signal with internal positive control (optional):

→ No interpretation statement can be made.

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

<p style="text-align: center;">Detection of <i>Salmonella enterica</i></p> <p style="text-align: center;">Amplification Plot</p> <p>ABI Prism® 7500: FAM channel, 530 nm 1:10 serial dilution of <i>S. Typhimurium</i> DNA</p>	<p style="text-align: center;">Detection of internal positive control CR-3</p> <p style="text-align: center;">Amplification Plot</p> <p>ABI Prism® 7500: Cy5 channel, 667 nm Internal positive control</p>	<p style="text-align: center;">Detection of internal positive control CR-1</p> <p style="text-align: center;">Amplification Plot</p> <p>ABI Prism® 7500: VIC channel, 554 nm Internal positive control</p>
<p style="text-align: center;">Mx3005P®: FAM channel</p> <p>1:10 serial dilution of <i>S. Typhimurium</i> DNA</p>	<p style="text-align: center;">Mx3005P®: CY5 channel</p> <p>Internal positive control</p>	<p style="text-align: center;">Mx3005P®: HEX channel</p> <p>Internal positive control</p>
<p style="text-align: center;">LightCycler® 480: FAM channel</p> <p>1:10 serial dilution of <i>S. Typhimurium</i> DNA</p>	<p style="text-align: center;">LightCycler® 480: Cy5 channel</p> <p>Internal positive control</p>	

9. Troubleshooting

9.1. No *Salmonella enterica* 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 IPC and no *Salmonella enterica* specific signal with sample

- The PCR reaction was inhibited. No interpretation can be made.
→ Make sure that you use a recommended method for DNA 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 DNA-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. *Salmonella enterica* specific signal with negative control

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

9.4. *Salmonella enterica* specific signal with negative control of DNA-extraction

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

10. Specifications

BactoReal® Kit *Salmonella enterica* was evaluated with the ABI PRISM® 7500 (Fast) instrument (Thermo Fisher Scientific), with the LightCycler® 480 (Roche) and the Mx3005P® (Agilent). For further validation data please contact ingenetix.

10.1. Analytical sensitivity

The analytical sensitivity is 7 target copies/PCR reaction. The limit of detection (LoD95 = smallest number of copies of target DNA which can be detected in 95% of cases) is 19 target copies/reaction and was determined by several replicates around the detection limit.

10.2. Analytical specificity

The specificity is ensured by the selection of highly specific primers and probes. The primers and probes were checked for possible homologies to currently published sequences by sequence comparison analyses. This also validated the detection of so far known *Salmonella enterica* strains. The kit is specific for *Salmonella enterica*. *Salmonella bongori* is detected with less sensitivity.

11. Annex – symbols



Batch code



Catalogue number



Contains sufficient for <n> tests



Use by



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Store at