Sacace BIOTECHNOLOGIES

CE 1023

IVD For *in Vitro* Diagnostic Use

For Professional Use Only

Chlamydia trachomatis/Ureaplasma/ M.genitalium/M.hominis Real-TM Handbook

Multiplex Real Time PCR kit for qualitative detection of *Chlamydia trachomatis*, *Ureaplasma species*, *Mycoplasma genitalium* and *Mycoplasma hominis*

REF **B60-100FRT**

Σ **100**

NAME

Chlamydia trachomatis/Ureaplasma/M.genitalium/M.hominis Real-TM

INTRODUCTION

STDs (sexually transmitted diseases) refer to a variety of bacterial, viral and parasitic infections that are acquired through sexual activity. Some STDs, such as syphilis and gonorrhea, have been known for centuries — while others, such as HIV, have been identified only in the past few decades. STDs are caused by more than 25 infectious organisms. As more organisms are identified, the number of STDs continues to expand. Common STDs include: chlamydia, gonorrhea, herpes, HIV, HPV, syphilis, gardnerella and trichomoniasis.
The Chlamydia trachomatis is nonmotile, gram-negative bacterial pathogen and is the most common sexually transmitted bacterial agent. The prevalence of C. trachomatis infection in sexually active adolescent women, the population considered most at risk, generally exceeds 10%, and in some adolescent and STD clinic populations of women, the prevalence can reach 40%. The prevalence of C. trachomatis infection ranges from 4 to 10% in asymptomatic men and from 15 to 20% in men attending STD clinics. Chlamydial infections in newborns occur as a result of perinatal exposure; approximately 65% of babies born from infected mothers become infected during vaginal delivery.
The development of tests based on nucleic acid amplification technology has been the most important advance in the field of STD diagnosis. Because nucleic acid amplification is exquisitely sensitive and highly specific, it offers the opportunity to use noninvasive sampling techniques to screen for infections in asymptomatic individuals who would not ordinarily seek clinical care.

INTENDED USE

Chlamydia trachomatis/Ureaplasma/M.genitalium/M.hominis Real-TM PCR kit is an *in vitro* nucleic acid amplification test for multiplex detection of *Chlamydia trachomatis, Ureaplasma* (*parvum* and *urealyticum*), *Mycoplasma genitalium* and *Mycoplasma hominis* DNA in clinical materials (urogenital, rectal and pharyngeal swabs; conjunctival discharge; prostate gland secretion; and urine samples) by using real-time hybridization-fluorescence detection.

The results of PCR analysis are taken into account in complex diagnostics of disease.

PRINCIPLE OF PCR DETECTION

C.trachomatis / Ureaplasma / M.genitalium/ M.hominis detection by the multiplex polymerase chain reaction (PCR) is based on the amplification of pathogen genome specific region using specific *C.trachomatis / Ureaplasma / M.genitalium / M.hominis* primers. In real-time PCR, the amplified product is detected using fluorescent dyes. These dyes are linked to oligonucleotide probes which bind specifically to the amplified product during thermocycling. The real-time monitoring of the fluorescence intensities during the real-time PCR allows the detection of accumulating product without re-opening the reaction tubes after the PCR run.

Chlamydia trachomatis/Ureaplasma/M.genitalium/M.hominis Real-TM PCR kit is a qualitative test that contains the Internal Control (IC). It must be used in the extraction procedure in order to control the extraction process of each individual sample and to identify possible reaction inhibition.

Chlamydia trachomatis/Ureaplasma/M.genitalium/M.hominis Real-TM PCR kit uses "hot-start", which greatly reduces frequency of nonspecifically primed reactions. "Hot-start" is guaranteed by chemically modified polymerase (TaqF), which is activated by heating at 95 ºC for 15 min.

CONTENT

Reagent	*Description*	*Volume, ml*	*Quantity*
PCR-mix-1-FRT *C.trachomatis* / *Ureaplasma* / *M.genitalium*/ *M.hominis*	colorless clear liquid	1.1	1 tube
PCR-mix-2-FRT	colorless clear liquid	0.6	1 tube
Polymerase (TaqF)	colorless clear liquid	0.06	1 tube
Positive Control complex (C+)	colorless clear liquid	0.2	1 tube
DNA-buffer	colorless clear liquid	0.5	1 tube
Negative Control (C–)*	colorless clear liquid	1.2	1 tube
Internal Control-FL (IC)**	colorless clear liquid	1.0	1 tube

**must be used in the extraction procedure as Negative Control of Extraction.*

*** add 10 µl of Internal Control-FL during the DNA extraction procedure directly to the sample/lysis mixture (see DNA-sorb-A **REF** K-1-1/A protocol).*

ADDITIONAL REQUIREMENTS

- DNA extraction kit.
- Transport medium.
- Disposable powder-free gloves.
- Pipettes (adjustable).
- Sterile pipette tips with aerosol barriers up to 200 µl.
- Tube racks.
- Vortex mixer.
- Desktop centrifuge with rotor for 2 ml reaction tubes.
- PCR box.
- Rotor-Gene 6000/Q (Qiagen) Instrument;
- Disposable polypropylene microtubes for PCR (0.1- or 0.2-ml).
- Refrigerator for 2–8 °C.
- Deep-freezer for ≤ –16 °C.
- Waste bin for used tips.

QUALITY CONTROL

In accordance with Sacace's ISO 13485-Certified Quality Management System, each lot is tested against predetermined specifications to ensure consistent product quality.

PRODUCT USE LIMITATIONS

All reagents may exclusively be used in in vitro diagnostics. Use of this product should be limited to personnel trained in the techniques of DNA amplification (UNI EN ISO 18113-2:2012). Strict compliance with the user manual is required for optimal PCR results. Attention should be paid to expiration dates printed on the box and labels of all components. Do not use a kit after its expiration date.

WARNINGS AND PRECAUTIONS

IVD ***In Vitro* Diagnostic Medical Device**

For *In Vitro* Diagnostic Use Only

1. Wear disposable gloves, laboratory coats and eye protection when handling specimens and reagents. Thoroughly wash hands afterward.
2. Do not pipette by mouth.
3. Do not eat, drink, smoke, apply cosmetics, or handle contact lenses in laboratory work areas.
4. Do not use a kit after its expiration date.
5. Dispose of all specimens and unused reagents in accordance with local regulations.
6. Biosafety Level 2 should be used for materials that contain or are suspected of containing infectious agents.
7. Clean and disinfect all spills of specimens or reagents using a disinfectant such as 0,5% sodium hypochlorite, or other suitable disinfectant.
8. Avoid contact of specimens and reagents with the skin, eyes and mucous membranes. If these solutions come into contact, rinse immediately with water and seek medical advice immediately.
9. Material Safety Data Sheets (MSDS) are available on request.
10. Use of this product should be limited to personnel trained in the techniques of DNA amplification.
11. PCR reactions are sensitive to contamination. Measures to reduce the risk of contamination in the laboratory include physically separating the activities involved in performing PCR in compliance with good laboratory practice.
12. Workflow in the laboratory must proceed in a uni-directional manner, beginning in the Extraction Area and moving to the PCR and Detection Area. Do not return samples, equipment and reagents in the area where you performed previous step.

⚠ *Some components of this kit contain sodium azide as a preservative. Do not use metal tubing for reagent transfer.*

⚠ *Sampling of biological materials for PCR-analysis, transportation, and storage are described in details in the handbook of the manufacturer. It is recommended that this handbook is read before beginning of the work.*

STORAGE INSTRUCTIONS

Chlamydia trachomatis/Ureaplasma/M.genitalium/M.hominis Real-TM must be stored at 2-8°C. **Polymerase (TaqF)** and **PCR-mix-2-FRT** must be stored at -20°C. The kit can be shipped at 2-8°C but should be stored at 2-8°C and -20°C immediately on receipt.

STABILITY

Chlamydia trachomatis/Ureaplasma/M.genitalium/M.hominis Real-TM is stable up to the expiration date indicated on the kit label. The product will maintain performance through the control date printed on the label. Exposure to light, heat or humidity may affect the shelf life of some of the kit components and should be avoided. Repeated thawing and freezing of these reagents should be avoided, as this may reduce the sensitivity.

SAMPLE COLLECTION, STORAGE AND TRANSPORT

Chlamydia trachomatis/Ureaplasma/M.genitalium/M.hominis Real-TM can analyze DNA extracted from:

- *cervical, urethral, rectal, conjunctival, oropharyngeal swabs:* insert the swab into the nuclease-free 1,5 ml tube and add 0,2-0,5 ml of Transport medium (can be ordered separately, Sacace REF K12-Stab). Vigorously agitate swabs in medium for 15-20 sec.
- *urine sediment* : collect 10-20 ml of first-catch urine in a sterile container. Centrifuge for 30 min at 3000 x g, carefully discard the supernatant and leave about 200 µl of solution. Resuspend the sediment. Use the suspension for the DNA extraction.
- *prostatic liquid* stored in “Eppendorf” tube;
- *seminal liquid:* maintain semen for 40 min in darkness until liquefaction. Use 100 µl for the DNA extraction.

It is recommended to process samples immediately after collection. Store samples at 2–8 °C for no longer than 24 hours, or freeze at -20/-80°C. Transportation of clinical specimens must comply with country, federal, state and local regulations for the transport of etiologic agents.

DNA ISOLATION

Any commercial RNA/DNA isolation kit, if IVD-CE validated for the specimen types indicated herein at the "SAMPLE COLLECTION, STORAGE AND TRANSPORT" paragraph, could be used.

Sacace Biotechnologies recommends to use the following kit:

⇒ **DNA-Sorb-A** (Sacace, REF K-1-1/A);

⇒ **SaMag STD DNA Extraction kit** (Sacace, REF SM007).

Please carry out the DNA extraction according to the manufacturer's instructions. Add 10 µl of Internal Control-FL (IC) during the DNA isolation procedure directly to the sample/lysis mixture.

(Note: the Sacace Internal Control is the same for all urogenital infectious kits)

REAGENTS PREPARATION (REACTION VOLUME 25 µL):

The total reaction volume is **25 µl**, the volume of DNA sample is **10 µl**.

1. Prepare the required number of the tubes for amplification of DNA from clinical and control samples (0.2-ml tubes for a 36-well rotor or 0.1-ml strips for a 72-well rotor).
2. For carrying out N reactions (including 2 controls), mix in a new tube: **10*(N+1) µl of PCR-mix-1-FRT *C.trachomatis* / *Ureaplasma* / *M.genitalium* / *M.hominis*, 5.0*(N+1) µl of PCR-mix-2-FRT** and **0.5*(N+1) µl of polymerase (TaqF)**. Vortex the tube, then centrifuge shortly. Transfer **15 µl** of the prepared mix to each tube.
3. Using tips with aerosol barrier, add **10 µl** of **DNA** obtained from clinical or control samples at the DNA extraction stage to the prepared tubes.

4. Carry out the control amplification reactions:

NCA -Add **10 µl** of **DNA-buffer** to the tube labeled NCA (Negative Control of Amplification).

C+ -Add **10 µl** of **Positive Control complex** to the tube labeled C+ (Positive Control of Amplification).

Amplification

Create a temperature profile on your instrument as follows:

	***Rotor type instrument*[1]**			***Plate type instrument*[2]**		
Step	***Temp. °C***	***Time***	***Cycle repeats***	***Temp. °C***	***Time***	***Cycle repeats***
1	95	15 min	1	95	15 min	1
2	95	5 s	5	95	5 s	5
	60	20 s		60	20 s	
	72	15 s		72	15 s	
3	95	5 s	40	95	5 s	40
	60	**20 s***		60	**30 s***	
	72	15 s		72	15 s	

[1] For example Rotor-Gene™ 6000/Q (Qiagen) [2] For example, SaCycler5-96™ (Sacace), CFX96™ (BioRad);

* Fluorescence is detected at the Step 3 **(60 °C)** in FAM/Green, JOE/Yellow/HEX/Cy3, ROX/Orange/Texas Red, Cy5/Red and Cy5.5/Crimson channels.

DATA ANALYSIS

- ***Chlamydia trachomatis* DNA** PCR product is detected in the **Green** channel,
- ***Ureaplasma* DNA** is detected in the **Yellow** channel,
- ***Mycoplasma genitalium* DNA** is detected in the **Orange** channel,
- ***Mycoplasma hominis* DNA** is detected in the **Crimson** channel,
- **Internal Control DNA** is detected in the **Red** channel.

INSTRUMENT SETTINGS (Rotor-Gene 6000/Q)

Make the adjustment of the fluorescence channel sensitivity: *Channel Setup → Gain Optimisation → Auto Gain Optimisation Setup →Optimise Acquiring* and select *Perform Optimisation Before 1-st Acquisition.* For *Green* channel indicate *Min Reading* **5**, *Max Reading* **10** and for *Yellow, Orange, Red, Crimson* channels *Min Reading* **4**, *Max Reading* **8**. In the column *Tube position* program position of the tubes in the carousel of the Rotor-Gene (the 1st position must contains reaction tube with reagents). Close the window *Auto Gain Calibration Setup.*

RESULTS ANALYSIS:

1. The results are interpreted with the software of **Rotor-Gene** through the presence of crossing of fluorescence curve with the threshold line.
2. Press *Analysis* then select button *Quantitation*. Perform the operation for the channel Green (*Cycling A. Green),* then for the channels Yellow (*Cycling A. Yellow),* Orange *(Cycling A.Orange),* Red *(Cycling A.Red)* and Crimson *(Cycling A.Crimson)*

2.1. Data analysis of *Chlamydia trachomatis* DNA

- Click **Green** channel on the curve.
- Select the **Dynamic tube** button in the main window menu.
- In **CT Calculation** menu set **Threshold = 0.1**.
- Select **Outlier Removal** button and type **0** in the text field.
- The Ct (Threshold cycle) values for each sample in channel will be shown in the results grid.

2.2. Data analysis of *Ureaplasma* DNA

- Click **Yellow** channel on the curve.
- Select the **Dynamic tube** button in the main window menu.
- In **CT Calculation** menu set **Threshold = 0.1**.
- Select **Outlier Removal** button and type **5** in the text field.
- The Ct (Threshold cycle) values for each sample in channel will be shown in the results grid.

2.3. Data analysis of *Mycoplasma genitalium* DNA

- Click **Orange** channel on the curve.
- Select the **Dynamic tube** button in the main window menu.
- In **CT Calculation** menu set **Threshold = 0.1**.
- Select **Outlier Removal** button and type **5** in the text field.
- The Ct (Threshold cycle) values for each sample in channel will be shown in the results grid.

2.4. Data analysis of *Mycoplasma hominis* DNA

- Click **Crimson** channel on the curve.
- Select the **Dynamic tube** and **Slope Correct** buttons in the main window menu.
- In **CT Calculation** menu set **Threshold = 0.1**.
- Select **Outlier Removal** button and type **20** in the text field.
- The Ct (Threshold cycle) values for each sample in channel will be shown in the results grid.

2.5. Data analysis of the IC amplification

- Click **Red** channel on the curve.
- Select the **Dynamic tube** and **Slope Correct** buttons in the main window menu.
- In **CT Calculation** menu set **Threshold = 0.07**.
- Select **Outlier Removal** button and type **5** in the text field.
- The Ct (Threshold cycle) values for each sample in channel will be shown in the results grid.

3. The sample is considered to be positive for *Chlamydia trachomatis* if its Ct value is defined in the results grid (the fluorescence curve crosses the threshold line) in the Green channel.
4. The sample is considered to be positive for *Ureaplasma* if its Ct value is defined in the results grid (the fluorescence curve crosses the threshold line) in the Yellow channel.
5. The sample is considered to be positive for *Mycoplasma genitalium* if its Ct value is defined in the results grid (the fluorescence curve crosses the threshold line) in the Orange channel.
6. The sample is considered to be positive for *Mycoplasma hominis* if its Ct value is defined in the results grid (the fluorescence curve crosses the threshold line) in the Crimson channel.
7. The sample is considered to be negative for *Chlamydia trachomatis*, *Ureaplasma, Mycoplasma genitalium* and *Mycoplasma hominis* if its Ct value is not defined in the results grid (the fluorescence curve does not cross the threshold line) in Green, Yellow, Orange and Crimson channels and the Ct value does not exceed the boundary value in the results grid in the Red channel (see below table).

Table 2. Results for controls

Sample	Channel	Boundary *Ct* value	
		for rotor-type instruments	for plate-type instruments
C+	FAM (Green)	<30	<33
	JOE (Yellow)	<33	<36
	ROX (Orange)	<33	<36
	Cy5 (Red)	<33	<36
	Cy5.5 (Crimson)	<33	<36
Samples, C–	Cy5 (Red)	<33	<36

QUALITY CONTROL PROCEDURE

A defined quantity of Internal Control (IC) is introduced into each sample and control at the beginning of sample preparation procedure in order to control the extraction process of each individual sample and to identify possible reaction inhibition.

A negative control of extraction (NCE), negative amplification control (NCA), positive amplification control (C+) are required for every run to verify that the specimen preparation, the amplification and the detection steps are performed correctly.

If the controls are out of their expected range (see table Results for Controls), all of the specimens and controls from that run must be processed beginning from the sample preparation step.

PERFORMANCE CHARACTERISTICS

Sensitivity

The analytical sensitivity for *Chlamydia trachomatis*, *Ureaplasma*, *Mycoplasma genitalium,* and *Mycoplasma hominis* is not less than $5x10^2$ genome equivalents per 1 ml of sample (GE/ml).

The analytical sensitivity of each microorganism does not change even at high concentrations of the three other microorganisms.

Specificity

The analytical specificity of **Chlamydia trachomatis/Ureaplasma/M.genitalium/ M.hominis Real-TM** PCR kit is ensured by selection of specific primers and probes as well as stringent reaction conditions. The primers and probes were checked for possible homologies to all sequences published in gene banks by sequence comparison analysis. The clinical specificity of **Chlamydia trachomatis/Ureaplasma/M.genitalium/M.hominis Real-TM** PCR kit was confirmed in laboratory clinical trials.

TROUBLESHOOTING

1. Weak or no signal of the IC (Red channel) for the Negative Control of extraction.
    - The PCR was inhibited.
        - ⇒ Make sure that you use a recommended DNA extraction method and follow to the manufacturer's instructions.
        - ⇒ Re-centrifuge all the tubes before pipetting of the extracted DNA for 2 min at maximum speed (12000-16000 g) and take carefully supernatant. Don't disturb the pellet, sorbent inhibit reaction.
    - The reagents storage conditions didn't comply with the instructions.
        - ⇒ Check the storage conditions
    - The PCR conditions didn't comply with the instructions.
        - ⇒ Check the PCR conditions and select for the IC detection the fluorescence channel reported in the protocol.
    - The IC was not added to the sample during the pipetting of reagents.
        - ⇒ Make attention during the DNA extraction procedure.
2. Weak or no signal of the Positive Control.
    - The PCR conditions didn't comply with the instructions.
        - ⇒ Check the amplification protocol and select the fluorescence channel reported in the manual.
3. Any signal with Negative Control of extraction (except for Red channel).
    - Contamination during DNA extraction procedure. All samples results are invalid.
        - ⇒ Decontaminate all surfaces and instruments with sodium hypochlorite and ethanol.
        - ⇒ Use only filter tips during the extraction procedure. Change tips between tubes.
        - ⇒ Repeat the DNA extraction with the new set of reagents.
4. Any signal with Negative Control of PCR.
    - Contamination during PCR preparation procedure. All samples results are invalid.
        - ⇒ Decontaminate all surfaces and instruments with sodium hypochlorite and ethanol or special DNA decontamination reagents.
        - ⇒ Pipette the Positive control at last.
        - ⇒ Repeat the PCR preparation with the new set of reagents.

KEY TO SYMBOLS USED

REF	List Number		Caution!
LOT	Lot Number		Contains sufficient for <n> tests
IVD	For *in Vitro* Diagnostic Use	VER	Version
	Store at	**NCA**	Negative Control of Amplification
	Manufacturer	**C–**	Negative control of Extraction
	Consult instructions for use	**C+**	Positive Control of Amplification
	Expiration Date	**IC**	Internal Control

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