

ASSAY NAME: UTI7_QS
(Urinary Tract Infections Panel 7 for QS)
Quantity: 100 x 20µL PCR reactions
5-plex assay: *Candida* genus, *Staphylococcus epidermidis*, *Pseudomonas aeruginosa*, *Enterobacter cloacae*, and human RPP30 DNA
SKU #: BUN-UTI7-D-QS-100 (QuantStudio)
(RUO). Research Use Only. Not for use in Diagnostic Procedures.
SCOPE OF THIS DOCUMENT:

The oligonucleotide recipes are optimized for each instrument (QuantStudio, BioRad). The verification data presented in this PIS were performed using BUN-UTI7-D-QS-100 on a QuantStudio™ 7 Flex Real-Time System. The performance of the other SKUs on their corresponding instrument should be similar. Contact PCRassays.com if you are planning to use a different instrument.

CONTENTS

The primers and probes in the UTI7_QS assay are provided in Tube 1 as a 5X concentrated working solution that detects 4 pathogens and a human control. The primers and probe for the *Candida* genus assay detects at least 27 species of *Candida* (many with alternative names) including: *C. africana*, *C. albicans*, *C. auris*, *C. bracarensis* (*Nakaseomyces bracarensis*), *C. dubliniensis*, *C. duobushaemulonii*, *C. glabrata* (*Nakaseomyces glabratus*, *Cryptococcus glabratus*), *C. guilliermondii* (*Meyerozyma guilliermondii*, *Pichia guilliermondii*), *C. guilliermondii* var *membrane-faciens* (*Kodamaea ohmeri*), *C. inconspicua*, *C. krusei* (*Pichia kudriavzevii*, *Issatchenkia orientalis*), *C. lusitaniae* (*Clavispora lusitaniae*, *C. obtusa*), *C. mesorugosa* (*Diutina mesorugosa*), *C. metapsilosis*, *C. neorugosa* (*Diutina neorugosa*), *C. nivariensis*, *C. norvegensis* (*Pichia norvegensis*), *C. parapsilosis*, *C. pararugosa*, *C. pseudohaemulonii*, *C. pseudorugosa* (*Diutina pseudorugosa*), *C. pulcherrima*, *C. robusta* (*Saccharomyces cerevisiae*), *C. rugosa* (*Diutina rugosa*), *C. tropicalis*, *Debaryomyces hansenii*, *Meyerozyma caribbica*. The design targets an uncharacterized protein (Protein ID: XM_445466.1, in NC_006027.1) that is conserved in most *Candida* genomes.

Table of Dyes used in this assay:

Pathogen/Target	Dyes	Quencher	Refs.
<i>Candida</i> genus	FAM	BHQ-1	1,2
<i>S. epidermidis</i>	HEX	BHQ-1	3
RPP30-DNA control	TAMRA	BHQ-2	4, 6
<i>P. aeruginosa</i>	TEX615	BHQ-2	5, 6
<i>E. cloacae</i>	Cy5	BHQ-2	7

ASSAY HANDLING

The UTI7_QS assay is shipped at ambient temperature, and should be stored at -20 °C. The assay should be kept on ice once thawed. Do not subject the enzyme to multiple freeze-thaw cycles.

ASSAY CONTENTS:

Tube 1: 5X Primer/Probe mix for *Candida* genus, *S. epidermidis*, *P. aeruginosa*, *E. cloacae*, and hRPP30DNA.



Tube 2: (Do NOT add to specimen unknowns) Positive control: 5000 copies/µL of synthetic 500 bp DNA fragments for *Candida* genus, *S. epidermidis*, *P. aeruginosa*, *E. cloacae*, and hRPP30DNA.

Tube 3: InhibiTaq qPCR enzyme Mastermix (enough for 100 rxns. with 20 µL total volume). This is a custom formulation from Fortis Life Sciences to the specifications of PCRassays.com.

EXPERIMENTAL

Perform nucleic acid extraction/purification (recommended). Since some of the bacteria detected by this assay are Gram+, it is important to use an extraction procedure with an appropriate cell wall lysis agent.

Contamination should be avoided by using appropriate personal protective equipment (PPE), powder free gloves, aerosol barrier pipette tips, and a clean hood.

Set up your PCR reaction (20 µL) as follows on ice:

Component	Volume (µL)
InhibiTaq enzyme mastermix (2X)	10
Primer/Probe mix (5X)	4
Sample	2
Water (Molecular Biology Grade)	4

Notes: To improve assay sensitivity, up to 6 µL of sample can be added (water volume adjusted accordingly) for a total reaction volume of 20 µL. For positive control rxns., add 2 µL of the solution from Tube 2.

A PCR protocol was used for verification on a QuantStudio™ 7 Flex Real-Time System, with the following program:

Step	Thermocycling Protocol:
1	Incubate @ 95 °C for 2 minutes
2	Incubate @ 95 °C for 3 seconds
3	Incubate @ 55 °C for 22 seconds
4	Plate Read
5	Go to Step 2, repeat 44x more

RESULT INTERPRETATION

After running the qPCR reaction, use the instrument software to determine the quantification cycle, C_q (or use C_T if your instrument does not have the capability to compute a C_q). Fluorescence channels with a $C_q < 38$ cycles, and final RFU > Threshold is considered “positive” or “+” in the Table below. The “Threshold” value for calling a PCR positive is dependent on the instrument model, well size, and sample volume; thus the user must determine the threshold that is appropriate for their method. For our QuantStudio 7 Flex with 100 µL wells and 20 µL reaction volume, the average RFU was approximately 1,000,000 we used a threshold of 200,000 for calling positives or “+” in the Table below.

<i>Candida</i> genus FAM™	<i>S. epidermidis</i> S HEX™	hRPP30 TAMRA™	<i>P. aeruginosa</i> TEX615™	<i>E. cloacae</i> Cy5™	Recommended Interpretation
—	—	—	—	—	The PCR reaction failed. Please repeat the experiment.
—	—	+	—	—	The sample does not contain pathogen DNA. The sample contains human RPP30 DNA.
+	—	—	—	—	The sample contains <i>Candida</i> genus DNA. The sample may not contain human RPP30 DNA.
+	—	+	—	—	The sample contains <i>Candida</i> genus DNA and human RPP30 DNA.
—	+	—	—	—	The sample contains <i>S. epidermidis</i> DNA. The sample may not contain human RPP30 DNA.
—	+	+	—	—	The sample contains <i>S. epidermidis</i> DNA and human RPP30 DNA.
—	—	—	+	—	The sample contains <i>P. aeruginosa</i> DNA. The sample may not contain human RPP30 DNA.
—	—	+	+	—	The sample contains <i>P. aeruginosa</i> DNA and human RPP30 DNA.
—	—	—	—	+	The sample contains <i>E. cloacae</i> DNA. The sample may not contain human RPP30 DNA.
—	—	+	—	+	The sample contains <i>E. cloacae</i> DNA and human RPP30 DNA.
+	+	—	+	+	The sample contains <i>Candida</i> genus, <i>S. epidermidis</i> , <i>P. aeruginosa</i> , <i>E. cloacae</i> DNA. The sample may not contain human RPP30 DNA.
+	+	+	+	+	The sample contains <i>Candida</i> genus, <i>S. epidermidis</i> , <i>P. aeruginosa</i> , <i>E. cloacae</i> DNA and human RPP30 DNA.

VERIFICATION EXPERIMENTS

The UTI7_QS assay verification was carried out as a 5-plex assay, which simultaneously detects DNA from *Candida* genus, *S. epidermidis*, *P. aeruginosa*, *E. cloacae*, and human RPP30 DNA, which serves as a positive extraction-control assay.

Experiments were performed in triplicate using the experimental procedure given above, but with different samples added to each reaction. The samples used for the verification experiments contained 1×10^4 copies/reaction of 500 bp synthetic DNA constructs (from Twist Biosciences) harboring the regions of interest from the pathogen genomes, human RPP30 DNA gene, and human genomic DNA. Standard samples from ATCC of *C. albicans* (MYA-2876DQ), *C. glabrata* (2001DQ), *S. epidermidis* (12228DQ), and *P. aeruginosa* (47085DQ) were also used in the verification experiments. The results of these experiments are shown in **Figure 1** and indicate that the 5-plex specifically detects the different bacterial species in the human genomic DNA matrix.

The limit of detection (LOD) was estimated by performing serial dilution experiments in triplicate (**Figure 2**). For dilution series only target construct was added. The results show a limit of detection (LOD) < 10 copies/reaction.

Conclusion: The data in **Figure 1** indicate that the 5-plex primers and probes specifically detect and differentiate the bacterial types and are also compatible with RPP30_DNA positive control primers. Verifications of the four 2-plex assays (pathogen + control assays) (data not shown) indicate that human genomic DNA matrix doesn't affect detection of the pathogen DNA.

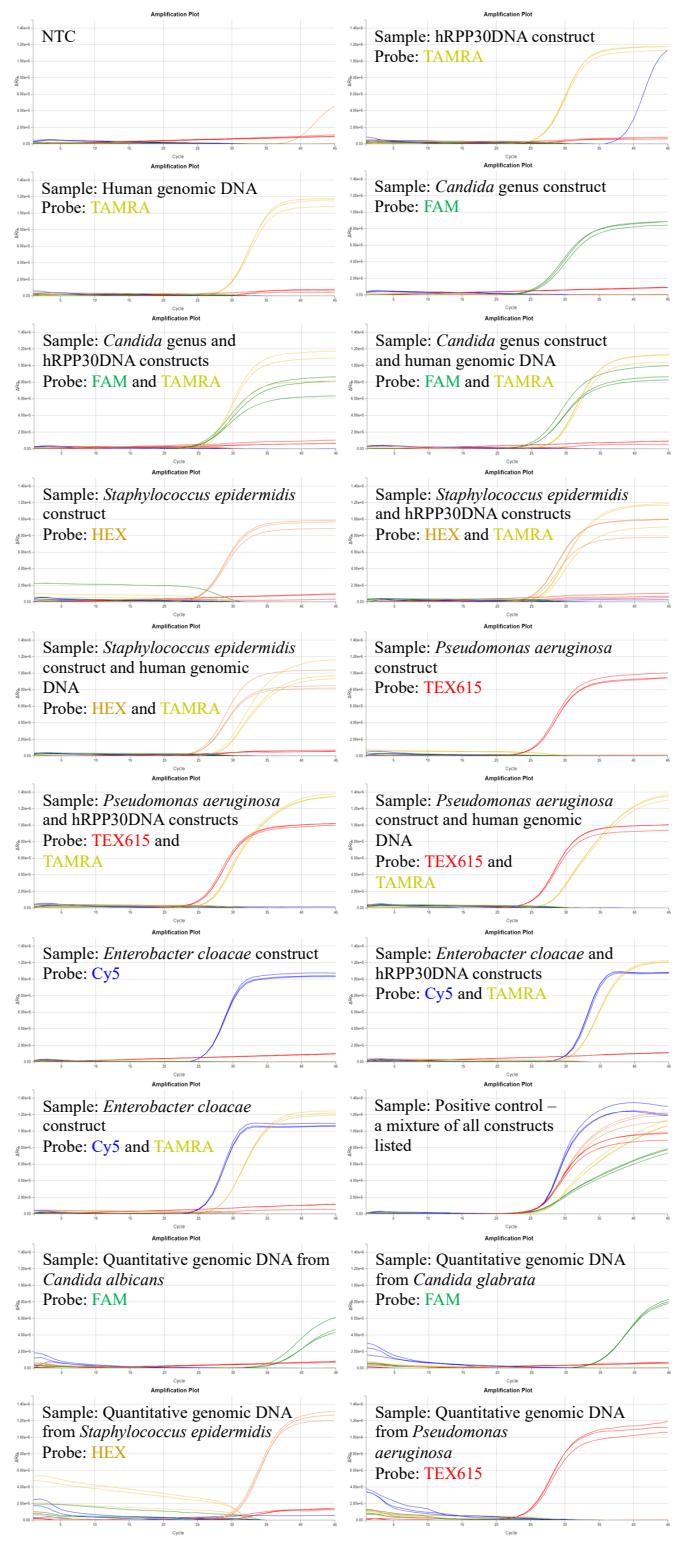


Figure 1: Verification experiments with single targets (given in text boxes for each panel). All sets of probes and primers are present in every reaction, but positive signal is only observed when the target(s) is present, indicating that the amplification is specific. Rarely signal from *E. cloacae* is observed with $Cq > 38$, which is considered negative.

NOTES

- ¹ FAM™ (Carboxyfluorescein) is a trademark of Life Technologies, Inc
- ² BHQ-1™ (Black Hole Quencher) is a trademark of Biosearch Tech., Inc.
- ³ HEX™ (Hexachloro-fluorescein) is a trademark of Applica Corp.
- ⁴ TAMRA (Carboxyltetramethylrhodamine) is a trademark of Applica Corp.
- ⁵ TEX615™ is a trademark of Thermo Fisher Scientific.
- ⁶ BHQ-2™ (Black Hole Quencher) is a trademark of Biosearch Tech. Inc.
- ⁷ Cy5™ is a trademark of GE Healthcare.
- ⁸ “TaqMan” is a trademark of Roche Molecular Systems, Inc.

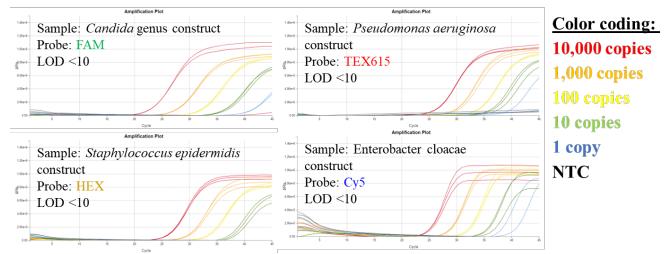


Figure 2: Serial dilution experiments show LOD <10 molecules for the synthetic DNA construct of each target.

CONTACT US

For assistance, please contact DNA Software using the link:
<https://www.pcrassays.com/contact/>

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