savyonDIAGNOSTICS
member of the Gamida Diagnostics Division

# savvy•gen Pneumocystis jirovecii

## REF 623-01L / 623-01H

## Test kit for 48 determinations


## For Professional Use Only

CE IVD

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## Intended Use

The Savvygen™ Pneumocystis jirovecii test allows the *qualitative* and *quantitative* detection and differentiation of *Pneumocystis jirovecii* in respiratory samples by Real-Time PCR. This test is intended for use as an aid in the diagnosis of *Pneumocystis jirovecii* in combination with patient history and additional clinical information.

**For in-vitro professional diagnostic use.**

## Background

*Pneumocystis jirovecii* is a yeast-like fungus of the genus Pneumocystis. The causative organism of Pneumocystis pneumonia, it is an important human pathogen, particularly among immunocompromised hosts. Prior to its discovery as a human-specific pathogen, *P. jirovecii* was known as *P. carinii* [1]. Pneumocystis pneumonia is an important disease of immunocompromised humans, particularly patients with HIV, but also patients with an immune system that is severely suppressed for other reasons.In humans with a normal immune system, it is an extremely common silent infection [2]. PCP is extremely rare in healthy people, but the fungus that causes this disease can live in their lungs without causing symptoms. In fact, up to 20% of adults might carry this fungus at any given time, and the immune system removes the fungus after several months [3]. Most people who get PCP have weakened immune systems, meaning that their bodies don't fight infections well. About 40% of people who get PCP have HIV/AIDS. The other 60% of people who get PCP are usually taking medicine that lowers the body's ability to fight germs or sickness or have other medical conditions, such as solid organ transplant, blood cancer, inflammatory diseases or autoimmune diseases (for example, lupus or rheumatoid arthritis and stem cell transplant [4].

Pneumocystis species cannot be grown in culture. Therefore, the availability of the human disease-causing agent, *P. jirovecii*, is limited. PCP is diagnosed using a sample from a patient's lungs. The sample is usually mucus that is either coughed up by the patient (called sputum) or collected by a procedure called bronchoalveolar lavage. Sometimes, a small sample of lung tissue (a biopsy) is used to diagnose PCP. The patient's sample is sent to a laboratory, usually to be examined under a microscope. Polymerase chain reaction (PCR) can also be used to detect Pneumocystis DNA in different types of samples. A blood test to detect β-D-glucan (a part of the cell wall of many different types of fungi) can also help diagnose PCP [5].

## Principles of the Procedure

The Savvygen™ Pneumocystis jirovecii test is designed for detection of *Pneumocystis jirovecii* in respiratory samples and to aid in the diagnosis and assessment of *Pneumocystis jirovecii* infection.

The Savvygen™ Pneumocystis jirovecii test is based on amplification of highly specific conserved fragments in the (mt LSU) rRNA gene of *Pneumocystis jirovecii* genom. Following DNA extraction from respiratory specimens, the conserved fragments are amplified by Taq DNA in Polymerase Chain Reaction (PCR). The assay is based on the 5'→3' exonuclease activity of Taq DNA Polymerase (figure 1). A fluorophore/quencher dual-labeled probe is annealing to an internal specific sequence. Upon primer elongation, Taq DNA Polymerase displaces and hydrolyzes the probe, thus releasing and activating the fluorophore. The presence of Pneumocystis jirovecii is detected by an increase in observed fluorescence during the reaction. The resulting increase in fluorescence signal is proportional to the amount of amplified product in the sample and detected by the real-time PCR thermocycler.

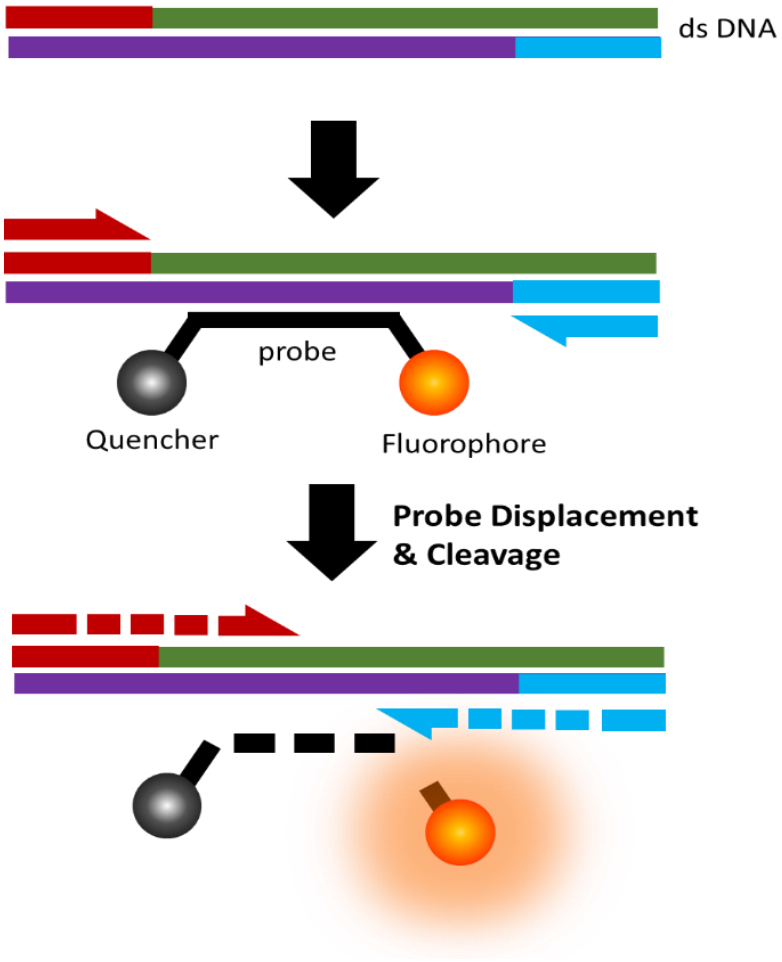


**Figure 1.** Principle of the Savvygen™ Pneumocystis jirovecii test

The Savvygen™ Pneumocystis jirovecii test is a ready-to-use assay containing in each well all the necessary reagents for the reaction in a stabilized format. An Extraction Control allows the identification of a possible inhibition of the sample extraction process and the amplification reaction. The optical channels used for multiplexed detection of the amplified fragments are outlined in table 1 below:

**Table 1.** Savvygen™ Pneumocystis jirovecii target and optical channel detection

| Target | Optical channel |
|---|---|
| *Pneumocystis jirovecii* | FAM |
| *Extraction Control* | *HEX, VIC or JOE |

*(*) Depending on the equipment used, the proper detection channel should be selected (see table 4).*

## Materials/ Reagents Provided

| Product Description | Contents |
|---|---|
| Savvygen™ Pneumocystis jirovecii<br>*48 reactions*.<br>Cat.# 623-01L / 623-01H | 6 x Savvygen™ Pneumocystis jirovecii 8-well strips |
| | 1 x Savvygen™ Pneumocystis jirovecii Positive Control |
| | 1 x Savvygen™ Pneumocystis jirovecii Quantitative Standard |
| | 1 x Savvygen™ Pneumocystis jirovecii Extraction Control |
| | 1x Water RNase/DNase free 1mL |
| | 1x Rehydration Buffer 1.8 mL |
| | 1x Negative Control 1 mL |
| | Optical caps |

***Additional Equipment and Material Required***

- DNA extraction kit (see Test Procedure section)
- Centrifuge for 1.5 mL tube.
- Vortex.
- Micropipettes (0.5-20 µL, 20-200 µL).
- Powder-free disposal gloves
- Real Time PCR thermalcycler (see table 2A+2B for compatible RT-PCRs).

**Table 2A.** Compatible Real-Time PCR instruments (Low-Profile)

| ***Bio-Rad*** | ***Applied Biosystems*** |
|---|---|
| CFX96 Touch™ Real-Time PCR Detection System | 7500 Fast Real-Time PCR System |
| ***Roche*** | 7500 Fast Dx Real-Time PCR System |
| LightCycler ®480 Real-Time PCR System | QuantStudio™ 6,7 or 12K Flex 96-well Fast |
| LightCycler ®96 Real-Time PCR System | QuantStudio™ 5 Real-Time PCR System |
| ***Agilent Technologies*** | ViiA™ 7 Fast Real-Time PCR System |
| AriaMx Real-Time PCR System | StepOne Plus™ Real-Time PCR System |
| ***DNA-Technology*** | StepOne™ Real-Time PCR System |
| DTlite Real-Time PCR System | ***Cepheid*** |
| DT prime Real-Time Detection Thermal Cycler | SmartCycler®* |
| | ***Qiagen*** |
| | *Rotor-Gen® Q** |

**Table 2B.** Compatible Real-Time PCR instrument (High-Profile)

| ***Bio-Rad*** | ***Applied Biosystems*** |
|---|---|
| *CFX96 Touch Deep Well Real-Time PCR Detection System* | *7500 Real-Time PCR System* |
| *iCycler iQ Real-Time PCR Detection System* | *QuantStudio™ 12K Flex 96-well* |
| *iCycler iQ 5 Real-Time PCR Detection System* | *QuantStudio™ 6 Flex 96-well* |
| ***DNA-Technology*** | *QuantStudio™ 7 Flex 96-well* |
| *DTlite Real-Time PCR System* | *QuantStudio™ 5 Real-Time PCR System* |
| *DT prime Real-Time Detection Thermal Cycler* | *ViiA™ 7 Real-Time PCR System* |
| ***Stratagene /Agilent Technologies*** | ***Qiagen*** |
| *Mx3000P™ Real-Time PCR System* | *Rotor-Gen® Q** |
| *Mx3005P™ Real-Time PCR System* | ***Cepheid*** |
| ***Analytik Jena Biometra*** | *SmartCycler®** |
| *TOptical* | ***Abbot*** |
| *qTOWER 2.0* | *Abbot m2000 RealTime System* |

* Once the product has been reconstituted following the appropriate procedure, transfer it into the specific Rotor-Gene® Q or SmartCycler® tubes.

***Note:*** Savvygen™ Pneumocystis jirovecii *test has been validated on the following equipment: Applied Biosystems 7500 Fast Real-Time PCR System, Bio-Rad CFX96 Touch™ Real-Time PCR Detection System, Agilent Technologies AriaMx Real-Time PCR System, DNA-Technology DTprime Real-time Detection Thermal Cycler, DNA-Technology DTlite Real-time Detection Thermal Cycler, Rotor-Gene® Q (Qiagen), SmartCycler® (Cepheid),*

## *Transport and Kit Storage*

The Savvygen kits can be shipped and stored at 2-37ºC until expiration date stated in the label. Keep all reagents of in the dark.
After resuspension of the Positive Control, and Extraction Control store at -20ºC. Avoid repeated freeze/thaw cycles. It is recommended to make aliquots of the positive control / Extraction Control and stored at -20ºC once resuspended in order to avoid freeze & thaw cycles.

## *Precautions*

Amplification technologies can amplify target nucleic acid sequences over a billion-fold and provide a means of detecting very low concentrations of target. Care must be taken to avoid contamination of samples with target molecules from other samples, or amplicons from previous amplifications. Follow these recommendations to help control contamination.

1. Separate pre-amplification steps from post-amplification steps. Use separate locations for pre- and post-amplification. Use dedicated lab equipment for each stage. Prepare samples in a laminar flow hood using dedicated equipment to minimize contamination. Set up the post-amplification area in a low-traffic area with dedicated equipment.
2. The laboratory process must be one-directional, it should begin in the Extraction Area and then move to the Amplification and Detection Areas. Do not return samples, equipment and reagents to the area in which the previous step was performed.
3. Use disposable containers, disposable barrier pipette tips, disposable bench pads, and disposable gloves. Avoid washable lab wear.

4. Use a diluted bleach solution (0.2% sodium hypochlorite) to treat waste from the post-amplification and detection areas, as the waste contains amplicon. Use the bleach solution to wipe down equipment and bench areas, as well as to treat drains used to dispose of liquid waste.
5. Use negative controls to monitor for possible contamination during reaction setup. If reagent contamination is detected, dispose of the suspect reagents.
6. Do not use after the expiration date stated on the box.
7. Specimens must be treated as potentially infectious as well as all reagents and materials that have been exposed to the samples and handled in the same manner as an infectious agent. Take necessary precautions during the collection, storage, treatment and disposal of samples.
8. Make sure not to confuse the vial for Pneumocystis jirovecii Positive Control with the Quantitative Standard.

## *Test Procedure*

***Specimen Collection, Processing and DNA Extraction***

In order to obtain an adequate sample, the procedure for sample collection must be followed closely and according to the manufacturer's instructions. The specimens should be transported as fast as possible and to be stored at the indicated temperatures conditions.

**Nucleic Acid (NA) Extraction**: for pre-treatment and NA isolation, it is recommended to use an appropriate DNA\RNA extraction kit according to manufacturer´s protocol. NA Extraction may be carried out manually or automatically using commercially available extraction kits. Several extraction systems were validated for this kit including:

- Invisorb® Spin Universal Kit (Stratec).
- EZ1 Virus Mini Kit, using EZ1 instrument (Qiagen).
- Maxwell® 16Viral Total Nucleic Acid Purification Kit, using the Maxwell ® 16 instrument (Promega).

***Note:*** If the Extraction Control is used as an internal control (sample extraction and PCR inhibition control), 5 µl of the Extraction Control needs to be added when performing the extraction procedure. The Extraction Control should always be added to the specimen-lysis buffer mixture and must not be added directly to the specimen.

In case and the Extraction Control is used only for PCR inhibition monitoring, 1µl should be added to the reconstituted Reaction-Mix.

***Extraction Control Preparation***

Open the Extraction Control pouch to re-suspend the lyophilized Extraction Control (green vial) by adding ***500 µ***L of Water RNase/DNase free (transparent cap tube) supplied and vortex thoroughly. Extraction Control contains known copy number of the internal control template, the recommendation is **to open and manipulate it in pre-PCR laboratory area away from the lyophilized positive control**.

Once the External Extraction Control has been re-suspended, store it at -20ºC. Recommendation is to separate it in aliquots to minimize freeze and thaw cycles.

***Positive Control and/or Quality Standard Preparation***

***Note:*** *The Positive Control / Quantitative Standard vials contains high-copy number template of the assay targets with a contamination risk. Therefore, it is recommend re-suspend the vial in a separate laboratory area or a special cabinet.*

Open the Positive control or the Quantitative Standard pouch to re-suspend the lyophilized material (red cap vials) with ***100 µl*** of Water RNase/DNase free (transparent cap vial) supplied. To ensure a complete re-suspension, vortex the vial thoroughly. After first use of the Positive Control, dispense into aliquots in order to avoid multiple freeze-thaw cycles, and store them at -20ºC.

***Standard Curve Preparation (For a Quantitative Assay)***

***Note:*** If the Savvygen™ Pneumocystis jirovecii test is used only for qualitative testing, a standard curve preparation is not required. Please continue to **PCR Protocol Program**.

In order to use the Savvygen™ Pneumocystis jirovecii as a quantitative test to quantify the copy number for *Pneumocystis jirovecii*, a serial dilutions of *Pneumocystis jirovecii* Quantitative Standard (i.e., P. jirovecii QS; approx. $2x10^7$ copies/µL*) should be performed by preparing a standard curve.

Follow the steps below to prepare the standard curve using the *P. jirovecii* Quantitative Standard.

1. Arrange 6 Eppendorf tubes, marked them 1-6 and pipette into each one 90 µL of Water RNase/DNase free.
2. Add 10 µL of *P. jirovecii* QS to the first dilution tube (tube #1) to reach a standard with an approximate concentration of $2x10^6$ copies/µL. Vortex for 5 sec.
3. Add 10 µL from tube 1 ($2x10^6$copies/µL) into the second tube to reach a concentration of $2x10^5$ copies/µL. Vortex for 5 sec.
4. Repeat the serial dilution up to tube #6, reaching a final dilution of 2x10copies/µL (see Figure 2) below

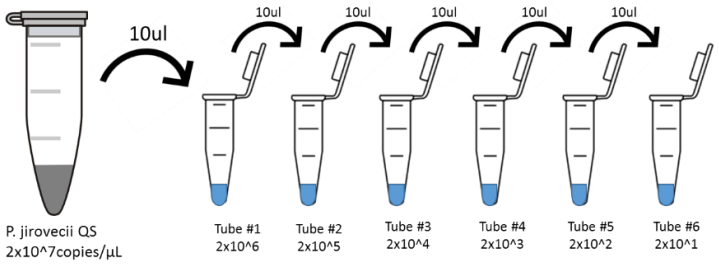


**Figure 2.** *Pneumocystis jirovecii* Quantitative Standard serial dilution

* See exact DNA copy number of *P. jirovecii* QS according to lot number in the "Certificate of analysis" provided with the kit.

***PCR Protocol Program*.**

Set your thermocycler to the following conditions below:

**Table 3.** Real time RT-PCR profile

| Step | Temperature | Time | Cycles |
|---|---|---|---|
| Initial denaturation | 95ºC | 2 min | 1 |
| Denaturation | 95ºC | 10 sec. | 45 |
| Annealing/Extension* | 60ºC | 50 sec. | |

***Note:*** *Set the fluorescence data collection during the extension step (*) through the FAM (P. jirovecii), HEX, JOE or VIC channels (Extraction Control) Depending on the equipment used select the proper detection channel (see table 4). In the Applied Biosystems 7500 Fast Real-Time PCR System and Stratagene Mx3005P™ Real Time PCR System check that the passive reference option for ROX is none.*

***Preparing Reaction Wells***

**A. Reconstitute the required reaction wells.**

Calculate the number of required reactions including samples and controls. ***If standard curve for quantitative analysis is desired, include 6 more wells in the reaction.***

1. Peel off protective aluminum seal from the strips/plate.
2. Pipette 15 µL of Rehydration Buffer (Blue cap vial) into each well.

**B. Add samples and controls according to real-time PCR experimental plate set up.**

1. Pipette 5 µL of DNA sample into each sample well.
2. Pipette 5 µL of resuspended *P. jirovecii* Positive Control (red cap vial) into the positive control well.
3. Pipette 5 µL of Negative Control (orange cap vial) into the negative control well.

   ***Note:*** We recommend adding 1 µl of the Extraction Control to the each well in case he Extraction control is used only as a PCR inhibition control (See Specimen Collection, Processing and DNA Extraction section).

4. Cover the wells with the caps provided. Spin down briefly if needed.

**C. Performing PCR.**

1. Place the strips in the Real-Time PCR instrument.
2. Start the run.

The fluorescence detection channels of common Real-Time PCR Thermocyclers are specified in Table 4.

**Table 4.** Detection fluorescence channels of different Real Time PCR systems

| ***RT- PCR THERMOCYCLER*** | ***System Detection channels*** | ***Savvygen probes channels*** | ***Remarks*** |
|---|---|---|---|
| **Roche LightCycler® 96 or LightCycler®480II** | 465/510 | FAM | Color Compensation is required only for LC480 system |
| | 533/580 | HEX | |
| | 533/610 | ROX | |
| | 618/660 | Cy5 | |
| **Applied Biosystems ABI 7500 fast** | FAM | FAM | Passive reference option ROX is not mark |
| | VIC | HEX | |
| | ROX | ROX | |
| | Cy5 | Cy5 | |
| **Bio-Rad CFX96 ™** | FAM | FAM | |
| | HEX | HEX | |
| | ROX | ROX | |
| | Cy5 | Cy5 | |
| **DNA-Technology DTlite / DTprime** | FAM | FAM | |
| | VIC | HEX | |
| | ROX | ROX | |
| | Cy5 | Cy5 | |
| **Agilent AriaMx** | FAM | FAM | |
| | HEX | HEX | |
| | ROX | ROX | |
| | Cy5 | Cy5 | |
| **Rotor-Gene®Q Qiagen** | Green | FAM | |
| | Yellow | HEX | |
| | Orange | ROX | |
| | Red | Cy5 | |

## *Interpretation of results*

Interpretation of results (table 5) can be automatically performed if programed by the user using the RT-PCR instrument software following manufacturer´s instructions. It is required to run assay controls (positive and negative controls) in each run to validate the reaction.

***Note:*** *The positive controls used in each run, must show an amplification curve of the tested targets (P. jirovecii) which validates the reaction while the negative control well should demonstrate an absence of signal (except Extraction Control target if added).*

***Qualitative Testing***

**Positive sample-** A sample is considered a positive if the obtained amplification curve signal is below threshold cycle 40.

**Negative sample-** A sample is considered negative for the target if there is no evidence of amplification curve signal in the detection system and the Extraction Control has a positive signal amplification.

**Extraction Control-** The extraction control must show an amplification curve, which verifies the correct function of the amplification mix. It should be noted that the detection of extraction control may not be necessary in case of positive result of *P. jirovecii*

**Positive control-** The positive control used in each run is expected to show an amplification curve for *P. jirovecii*, which validates the reaction.

**Negative control-** The negative control included in each run is expected to show no amplification curve signal for *P. jirovecii*, which validates the reaction.

**Invalid run-** The assay should be considered as invalid and a new run should be performed if there is a signal of amplification curve for *P. jirovecii* in the negative control well or absence of amplification curve signal in the positive control well.

***Note:*** If an amplification curve for the Extraction Control is not shown, it may be due to PCR inhibitors. In such case, the sample should be retested by dilution of the original sample 1:10. Alternatively, it is recommended to repeat the nucleic acid extraction.

**Table 5.** Results interpretation

| P. jirovecii (FAM) | Extraction control (Hex) | Negative Control | Positive Control | Interpretation |
|---|---|---|---|---|
| POS | POS / NEG | NEG | POS | *P. jirovecii* **Positive,** |
| NEG | POS | NEG | POS | *P. jirovecii* **Negative,** |
| POS | POS | POS | POS | **Invalid run** |
| NEG | NEG | NEG | NEG | **Invalid run** |

POS: **presents of an amplification signal**
NEG: **No amplification signal**

***Quantitative Testing interpretation***

In order to create the standard curve from the dilution series of *P. jirovecii* Quantitative Standard, the following formula should be used:

**Ct = m log (Q) + b** Where: Ct = Threshold Cycle
m = Slope
Q = P. jirovecii Concentration
b = Intercept

The positive samples with an unknown concentration can be quantified by interpolating their Ct values in the standard curve using the following formula:

$$Q = 10^{(Ct-b)/m}$$

## Limitations of the test

- The results of the test should be evaluated by a health care professional in the context of medical history, clinical symptoms and other diagnostic tests.
- This assay should be used only with samples from bronchoalveolar lavage (BAL). The use of other samples has not been established.
- Error results may occur from improper sample collection, handling, storage, technical error, sample mix-up, or because the number of organisms in the sample is below the analytical sensitivity of the test.
- The presence of PCR inhibitors may cause invalid results.
- A false positive result with other targets is possible due to contamination with PCR products from previous testing.
- As with all PCR-based *in-vitro* diagnostic tests, extremely low levels of target below the analytical sensitivity of the assay may be detected, but results may not be reproducible.
- If a certain sample result is Invalid then the sample should be repeated from DNA extraction.
- A False positive result is possible due to cross-contamination between the Pre-PCR area contaminated with Pneumocystis jirovecii Positive Control or Quantitative Standard which contains high copies template, during their reconstitution process. Please note that each procedure must be performed in designated cabin area or in separate laboratory areas.

## Quality Control

In order to confirm the appropriate performance of the molecular diagnostic technique, an Extraction Control (EC) is included in each reaction. Besides, a positive and a negative control must be included in each assay to interpret the results correctly.

## Performance Characteristics

***Clinical Sensitivity and Specificity***

The clinical performance of the Savvygen™ Pneumocystis jirovecii test was evaluated using 14 bronchoalveolar lavage samples from symptomatic patients using a commercial RT-PCR for *Pneumocystis jirovecii* (Fast-Track DIAGNOSTICS) as a reference. *Pneumocystis jirovecii* was detected in all 11 positive samples by the Savvygen™ Pneumocystis jirovecii test. The results show a high sensitivity and specificity to detect *Pneumocystis jirovecii* by the Savvygen™ Pneumocystis jirovecii test

***Analytical Sensitivity***

A serial dilution test was conducted to evaluate the analytical sensitivity of the Savvygen™ Pneumocystis jirovecii test for *Pneumocystis jirovecii*. This assay has a detection limit of ≥10 DNA copies per reaction.

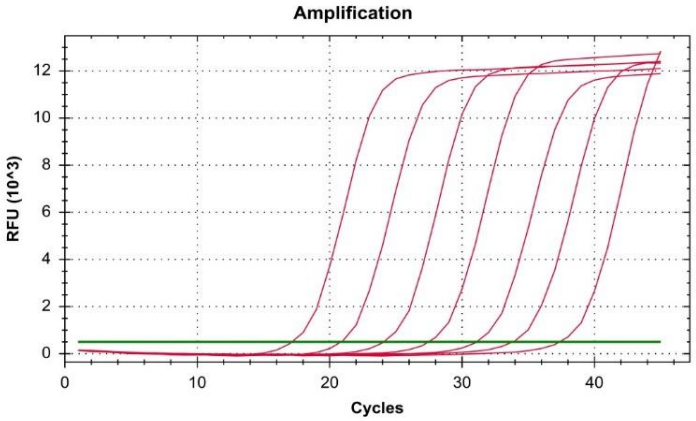


**Figure 3.** Amplification plot for 10-fold dilution of *Pneumocystis jirovecii.*

***Analytical Specificity***

The specificity of the Savvygen™ Pneumocystis jirovecii test was confirmed by testing a panel consisting of different microorganisms representing the most common pathogens that can cause respiratory disease, as well as meningitis and affect immunosuppressive patients in particular. No cross-reactivity was detected between any of the following microorganisms tested, except the targeted pathogens of each assay (table 6).

**Table 6.** Cross-reactivity testing**.**

| Pathogen | Analytical-Reactivity Test |
|---|---|
| | Savvygen™ Pneumocystis jirovecii |
| *Bordetella pertussis* | - |
| *Haemophilus influenzae* | - |
| *Human Adenovirus* | - |
| *Human coronavirus 229E* | - |
| *Human metapneumovirus A and B* | - |
| *Human parainfluenza 1, 2, 3 and 4 viruses* | - |
| *Human rhinovirus* | - |
| *Influenza B/Brisbane/60/2008 virus* | - |
| *Influenza B/Florida/04/06 virus* | - |
| *Influenza B/Phuket/3073/2013* | - |
| *Influenza A/California/7/2009(H1N1) virus* | - |
| *Influenza A/Perth/16/2009(H3N2) virus* | - |
| *Influenza A/New Caledonia/20/99(H1N1) virus* | - |
| *Influenza A/Switzerland/9715293/2013* | - |
| *Influenza A/Turkey/Germany R2485+86/2014* | - |
| *Legionella micdadei* | - |
| *Legionella dumoffii* | - |
| *Legionella longbeachae* | - |

| | |
|---|---|
| *Legionella pneumophila* | - |
| *Methicillin-resistant Staphylococcus aureus* | - |
| *Mycoplasma pneumoniae* | - |
| *Moraxella catarrhalis* | - |
| *Staphylococcus aureus subsp. aureus* | - |
| *Streptococcus pneumoniae* | - |
| *Fluoribacter bozemanae* | - |
| *Respiratory syncytial virus (RSV)* | - |

***Analytical Reactivity***

The reactivity of the Savvygen™ Pneumocystis jirovecii test was evaluated and confirmed versus positive samples of *Pneumocystis jirovecii.*

## Bibliography


1. Aliouat-Denis, C-M.; et al. (2008). "*Pneumocystis* species, co-evolution and pathogenic power". *Infection, Genetics and Evolution*. **8** (5): 708–726.
2. Ponce CA, Gallo M, Bustamante R, Vargas SL (2010). "Pneumocystis colonization is highly prevalent in the autopsied lungs of the general population". *Clin Infect Dis*. **50** (3): 347&ndash, 353.
3. Medrano FJ, Montes-Cano M, Conde M, et al. Pneumocystis jirovecii in general population. Emerging infectious diseases 2005;11:245-50.
4. Roux A, Canet E, Valade S, et al. Pneumocystis jirovecii pneumonia in patients with or without AIDS, France. Emerging infectious diseases 2014;20:1490-7.
5. Karageorgopoulos DE, Qu JM, Korbila IP, Zhu YG, Vasileiou VA, Falagas ME. Accuracy of beta-D-glucan for the diagnosis of Pneumocystis jirovecii pneumonia: a meta-analysis. Clinical microbiology and infection 2013;19:39-49 (19)


## Symbols for IVD Components and Reagents

| | | |
|---|---|---|
| Manufacturer | Use by | For i*n vitro* diagnostic use only |
| Lot number | Temperature limitation | Consult instructions for use |
| Catalogue number | Contains sufficient for <n> test | Buffer (sample diluent) |
| Keep Dry | | |


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