

# RIDASCREEN<sup>®</sup> Candida IgA, IgG, IgM

Article no: K9011 (IgA)  
K9021 (IgG)  
K9031 (IgM)



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## **1. Intended use**

For *in vitro* diagnostic use. The RIDASCREEN® Candida tests are enzyme immunoassays for the quantitative determination of IgA, IgG or IgM antibodies against *Candida albicans* and antigenically related species in human serum.

The tests should be used for confirmation purposes when there is a suspected case of infection with candida or for clarifying the immune status.

## **2. Summary and explanation of the test**

After infection with candida, specific antibodies are formed against the pathogen as a result of the response from the immune system. By using immunological methods, it is possible to determine the antibodies in the serum. Both the choice of the pathogen-specific antigen and the selected test method have a significant influence on the test result.

## **3. Test principle**

Purified antigens are coated to a microwell plate. Antibodies in the patient samples bind to the antigens and are determined during the second incubation step by using enzyme-labelled anti-human antibodies (the conjugate). The enzyme converts the colourless substrate ( $H_2O_2/TMB$ ) to a blue end product. The enzyme reaction is stopped by adding sulphuric acid and the colour of the mixture switches from blue to yellow at the same time. The final measurement is carried out at 450 nm on a photometer using a reference wavelength  $\geq 620$  nm.

## 4. Reagents provided

Table 1: Pack contents (there are enough reagents in a pack for 96 determinations)

			K9011 IgA	K9021 IgG	K9031 IgM
<b>Plate</b>	96 det.	Microwell plate; 12 microwell strips (can be divided) in the strip holder; coated with the Candida albicans antigen	X	X	X
<b>SeroPP</b>	110 ml	Sample buffer, ready for use; phosphate-buffered NaCl solution; coloured yellow	X	X	X
<b>SeroWP</b>	100 ml	Wash buffer, 10-fold concentrate; tris-buffered NaCl solution	X	X	X
<b>Control IgA +</b> <i>blue lid</i>	2.5 ml	Standard control IgA, ready for use; diluted human serum; coloured blue	X		
<b>Control IgG +</b> <i>green lid</i>	2.5 ml	Standard control IgG, ready for use; diluted human serum; coloured green		X	
<b>Control IgM +</b> <i>red lid</i>	2.5 ml	Standard control IgM, ready for use; diluted human serum; coloured red			X
<b>Control IgA -</b> <i>colourless lid</i>	1.2 ml	Negative control IgA, ready for use; diluted human serum	X		
<b>Control IgG -</b> <i>colourless lid</i>	1.2 ml	Negative control IgG, ready for use; diluted human serum		X	
<b>Control IgM -</b> <i>colourless lid</i>	1.2 ml	Negative control IgM, ready for use; diluted human serum			X
<b>Control IgA A</b> <i>blue lid</i>	1.2 ml	Quality control A IgA, ready for use; diluted human serum	X		
<b>Control IgA B</b> <i>blue lid</i>	1.2 ml	Quality control B IgA, ready for use; diluted human serum	X		
<b>Control IgG A</b> <i>green lid</i>	1.2 ml	Quality control A IgG, ready for use; diluted human serum		X	
<b>Control IgG B</b> <i>green lid</i>	1.2 ml	Quality control B IgG, ready for use; diluted human serum		X	
<b>Control IgM A</b> <i>red lid</i>	1.2 ml	Quality control A IgM, ready for use; diluted human serum			X
<b>Control IgM B</b> <i>red lid</i>	1.2 ml	Quality control B IgM, ready for use; diluted human serum			X
<b>SeroA HD</b> <i>blue lid</i>	12 ml	Anti-human IgA conjugate HD (goat); ready for use; peroxidase conjugated antibodies in stabilised protein solution	X		
<b>SeroG HD</b> <i>green lid</i>	12 ml	Anti-human IgG conjugate HD (goat); ready for use; peroxidase conjugated antibodies in stabilised protein solution		X	
<b>SeroM HD</b> <i>red lid</i>	12 ml	Anti-human IgM conjugate HD (goat); ready for use; peroxidase conjugated antibodies in stabilised protein solution			X

SeroSC	12 ml	Substrate; H <sub>2</sub> O <sub>2</sub> /tetramethylbenzidine; ready for use	X	X	X
Stop	12 ml	Stop reagent 0.5 M sulphuric acid; ready for use	X	X	X

Details of hazardous substances according to labeling obligations. For more details see Material Safety Data Sheets (MSDS) at [www.r-biopharm.com](http://www.r-biopharm.com).

## 5. Storage instructions

The test kit must be stored at 2 – 8 °C and can be used until the expiry date printed on the label. The diluted wash buffer can be used for a maximum of 4 weeks when stored at 2 – 8 °C or for one week when stored at room temperature (20 – 25 °C). After the expiry date, the quality guarantee is no longer valid.

The aluminium bag containing the microwell plate must be opened in such a way that the clip seal is not torn off. Any microwell strips which are not required must be immediately returned to the aluminium bag and stored at 2 – 8 °C.

The reagents also must not be allowed to become contaminated and the colourless substrate must be protected from exposure to direct light.

## 6. Additional necessary reagents – and necessary equipment

### 6.1. Reagents

- distilled or deionised water

### 6.2. Accessories

- Incubator at 37 °C
- Test tubes
- Vortex mixer
- Micropipettes for 10-100 µl and 100-1000 µl capacities
- Measuring cylinder (1000 ml)
- Timer
- Microplate washer or multichannel pipette
- Microplate reader (450 nm, reference wavelength ≥ 620 nm)
- Filter paper (laboratory towels)
- Waste container containing 0.5 % sodium hypochlorite solution

## 7. Precautions for users

For in vitro diagnostic use only.

This test must only be carried out by trained laboratory personnel. The guidelines for working in medical laboratories have to be followed. The instruction manual for the test procedure has to be followed. Do not pipet samples or reagents by mouth. Avoid contact with bruised skin or mucosal membranes. During handling reagents or samples, wear appropriate safety clothing (appropriate gloves, lab coat, safety goggles) and wash your hands after finishing the test procedure. Do not smoke, eat or drink in areas where samples or reagents are being used.

For more details see Material Safety Data Sheets (MSDS) at [www.r-biopharm.com](http://www.r-biopharm.com)

The control sera (standard control, negative control, quality control A and quality control B) in the kit have been tested for HIV- and HCV-Ab as well as HbsAg with negative results. Nevertheless, they must be treated as potentially infectious in the same way as the patient samples and all other materials with which they come into contact and they must be handled in accordance with the relevant national safety regulations.

All reagents and materials used have to be disposed properly after use. Please refer to the relevant national regulations for disposal.

## 8. Specimen collection and storage

The test has been developed for testing human serum samples. After blood collection, the serum should be separated from blood clots as soon as possible in order to prevent haemolysis. The samples must be stored cold or frozen until they are tested. Repeated freezing and thawing of the samples and microbial contamination must be prevented at all costs. Using heat-inactivated, lipaemic, haemolytic, icteric or turbid samples can lead to false results.

Table 2: Sample storage

Undiluted serum		Diluted serum
2 – 8 °C	-20 °C	2 – 8 °C
1 week	>1 week	7 hours

## 9. Test procedure

### 9.1. General information

All reagents and the microwell plate must be brought to room temperature (20 – 25 °C) before use. The microwell strips must not be removed from the aluminium bag until they have reached room temperature. The reagents must be thoroughly mixed immediately before use.

After use, the kit must be immediately returned to storage at 2 – 8 °C.

Take only the volume of reagents that is needed for test procedure. Do not pour reagents back into vials as reagent contamination may occur.

The microwell strips cannot be used more than once. The reagents and microwell strips must not be used if the packaging is damaged or the vials are leaking.

Some of the reagents in the kit are not test specific. The reagents labelled Sero (such as **SeroPP**) can also be used with other RIDASCREEN® Sero ELISA with the corresponding reagents.

**The control sera relate to the lot. Control sera from kits with different lot numbers must not be exchanged.**

**RIDASCREEN® Sero ELISA quality controls A and B are provided as additional components to the respective RIDASCREEN® Sero ELISA test kits. These are controls for additional quality control purposes which can be used optional. They contain human control serum with different antibody concentrations.**

### 9.2. Preparing the wash buffer

1 part wash buffer concentrate **SeroWP** is mixed with 9 parts distilled water. In order to do this, place 100 ml of the concentrate in a 1000 ml measuring cylinder and make up the solution to 1000 ml with distilled water. Any crystals present in the concentrate must be dissolved beforehand by warming in a water bath at 37 °C. The diluted wash buffer can be used for a maximum of 4 weeks when stored at 2 – 8 °C or for one week when stored at room temperature (20 – 25 °C).

### 9.3. Preparing the samples

Dilute the serum samples to be tested with sample buffer **SeroPP** before starting the test. Please follow the different dilutions for the IgA -, IgG and IgM determinations. The same predilution (1:10) can be made for all antibody classes:

1:200 dilution of the serum sample for IgM determination:

For example: 10 µl serum + 90 µl sample buffer (1:10)  
10 µl of this + 190 µl sample buffer (1:200 in total)

1:1000 dilution of the serum sample for the IgA/IgG determination:

For example: 10 µl serum + 90 µl sample buffer (1:10)  
10 µl of this + 990 µl sample buffer (1:1000 in total)

For the IgM determinations, it is recommended to subject the sera to IgG absorption (e.g. with RIDA® RF-Absorbens, Article no. Z0202) before testing.

**Note:**

**The negative control, standard control, quality control A and quality control B are ready for use and must NOT be diluted or absorbed.**

#### 9.4. First incubation

After insertion of a sufficient number of wells into the frame, pipette 100 µl diluted sera and 100 µl ready-to-use control into each of the corresponding wells leaving Position A1 (reagent blank value) empty. Add the negative control 

Control IgA	-
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, 

Control IgG	-
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 or 

Control IgM	-
-------------	---

 once and the standard control 

Control IgA	+
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, 

Control IgG	+
-------------	---

 or 

Control IgM	+
-------------	---

 in duplicate. Add the quality control 

Control IgA	A
-------------	---

 and 

Control IgA	B
-------------	---

 or the quality control 

Control IgG	A
-------------	---

 and 

Control IgG	B
-------------	---

 or the quality control 

Control IgM	A
-------------	---

 and 

Control IgM	B
-------------	---

 once. Cover the plate and incubate at 37 °C for 30 minutes in an incubator. During this process, the bottoms of the wells must not be in contact with heat- conductive materials. The microwell plate must be covered during incubation.

The controls which correspond to the determination (IgA, IgG or IgM) must be used.

A1	Reagent blank value
B1	Negative control
C1	Standard control
D1	Standard control
E1	Quality control A
F1	Quality control B
G1, H1	Patient serum 1 and 2 etc.

**Note:**

**The microwell plate must not be placed in a cold incubation container reaching 37 °C during incubation. The temperature of the container must be adjusted to 37 °C beforehand.**

#### 9.5. Washing

The wells must be emptied into a waste container containing hypochlorite solution for disinfection.

Then tap the plate upside down against absorbent paper in order to remove the residual liquid. After this, wash the plate 4 times using 300 µl wash buffer each time. Make sure that the wells are emptied completely by tapping them on an unused part of the absorbent paper after each wash.

**When using a microplate washer, make sure that the machine is correctly adjusted to the type of plate being used. After washing, tap the plate upside down against clean absorbent paper in order to remove any residual liquid.**

#### 9.6. Second incubation

Add 100 µl Anti-human IgA conjugate HD **SeroA HD**, Anti-human IgG conjugate HD **SeroG HD** or Anti-human IgM conjugate HD **SeroM HD** to the corresponding wells (including A1). Next, cover the plate and incubate at 37 °C for 30 minutes in an incubator (see Section 9.4).

#### 9.7. Washing

Wash 4 times in accordance with Section 9.5.

#### 9.8. Third incubation

Add 100 µl substrate **SeroSC** to each well. Then, cover the plate and incubate at 37 °C for 30 minutes in a moist chamber. After this, stop the reaction by adding 100 µl stop reagent **Stop** to each well. After mixing carefully (by lightly tapping the side of the plate), measure the absorbance at 450 nm (reference wavelength  $\geq$  620 nm) in a plate photometer. Calibrate the reagent blank value (Position A1) to zero.

### 10. Quality control and indications of instability or deterioration

For quality control purposes, the standard control (in duplicate) and the negative control must be used every time the test is carried out. The test has been carried out correctly if the average absorbance for the standard control at 450/620 nm is within the range stated on the enclosed data sheet. If the two individual measurements deviate from the average by more than 20 %, the test must be repeated. The absorbance for the negative control at 450/620 nm must be  $< 0.3$ .

RIDASCREEN® Sero ELISA quality controls A and B are additional controls for quality control purposes which can be used optional. The target values are stated on the enclosed, lot-specific quality assurance certificate. The obtained values (U/ml, IU/ml or mIU/ml) are recommended as reference values for the quality assurance in accredited laboratories.

If the values differ from those required, if the reagent is turbid or the substrate has turned blue before adding to the wells, it may indicate that the reagents have expired.



If the stipulated values are not met, the following points must be checked before repeating the test:

- Expiry date of the reagents used
- Functionality of the equipment being used (e.g. calibration)
- Correct test procedure
- Visual inspection of the kit components for contamination or leaks – a substrate solution which has turned blue must not be used.

If the conditions are still not fulfilled after repeating the test, please contact your local R-Biopharm distributor.

## 11. Evaluation and interpretation

The test can be evaluated using three different methods:

1. By using the standard curve provided in the kit
2. By using the table of values (see data sheet provided in the kit)
3. Mathematically using the 4-parameter method or the  $\alpha$  method

**The reagent blank value must be subtracted from each measured value before the evaluation.**

### 11.1. Evaluation by using the standard curve provided in the kit

In order to carry out the evaluation using the standard curve, a correction must be made to the average value for the standard control first in order to take into account any fluctuations which may occur from one day to the next. The correction factor F is calculated from the current measured average value for the standard control and its target value. The target value, which depends on the lot, is recorded on the enclosed data sheet.

$$F = \frac{\text{standard control target value}}{\text{standard control measured average value}}$$

All OD values for the samples must be multiplied by the factor F. The corresponding U/ml values are then read off the standard curve using the corrected values.

### 11.2. Evaluation by using the table of values

The absorbance for the standard control is used to identify the column in the table with the range of values which applies to the current measurement.

The measured absorbance for the sample is assigned to the appropriate range of values and then the titer in U/ml is read from the second column to the left in the table.

	U/ml	Range of values for the standard control	
			0.86 - 0.90
-	< 5.0		< 0.19
?	5.0 - 7.0		0.19 - 0.26
+	7.1 - 12.0		0.27 - 0.42
	12.1 - 25.0		0.43 - 0.75
	25.1 - 50.0		0.76 - 1.17
	50.1 - 100.0		1.18 - 1.59
	> 100.0		> 1.59

Figure 1: Example of an IgG determination  
(Extract from a lot-specific data sheet)

For example, the absorbance for the standard control for a certain measurement is 0.89. In this case, the column in the table with the range 0.86 - 0.90 is the one to use. A patient sample with an absorbance of 0.61 therefore corresponds to the titer range 12.1 - 25.0 U/ml. (The values cited are merely to be regarded as examples and may differ from the current values on the data sheet.)

The evaluation for the determined results (positive (+), negative (-) or equivocal (?)) must be taken from the first column of the table of values.

### 11.3. Mathematical evaluation

The required values for mathematical evaluation according to the 4-parameter method or the  $\alpha$ -method are recorded on the enclosed data sheet.

### 11.4. Test result

Table 3: Evaluation of the determined units

	IgA	IgG	IgM
negative	< 14 U/ml	< 5 U/ml	< 20 U/ml
equivocal	14 - 20 U/ml	5 - 7 U/ml	20 - 25 U/ml
positive	> 20 U/ml	> 7 U/ml	> 25 U/ml

## 12. Limitations of the method

The RIDASCREEN® Candida ELISA detect IgA, IgG or IgM antibodies against *Candida albicans* and antigenically related *Candida* species. The test cannot be used to derive a relationship between the extinction determined and occurrence of serious clinical symptoms. The results obtained must always be interpreted in combination with the clinical picture.

A negative result does not necessarily mean that there is no infection. During the early stages of the infection, the number of antibodies may still be so small that looking for them may yield a negative result. In this case, where an infection is suspected for clinical reasons the test should be repeated on a second sample of the serum collected two to four weeks later.

Two consecutive samples of sera should always be collected from a patient and subjected to serological testing in order to improve the quality of the diagnostics. The progress of the titre is important for interpreting the findings.

IgG antibodies against *Candida* are found in a large portion of the population. A positive IgG determination alone therefore does not allow the conclusion to be drawn that it is an acute development of the disease. The progress of the titer is important for interpreting the findings.

IgA antibodies provide information about a possible colonisation of mucous membranes with *Candida albicans*. A high or increasing IgA titer therefore indicates an acute colonisation. A decrease in the IgA titer indicates past infection.

A positive IgM finding indicates an acute development of the disease. It is probable that *Candida* or antigens of *Candida* have passed into the vascular system. However, a systemic manifestation can only be concluded in association with the clinical picture and case history.

A positive result does not rule out the presence of another infectious pathogen as the cause of the disease.

## 13. Performance characteristics

Table 4: Inter-assay variation (n = 30)

<u>Inter-assay variation</u>	<u>IgA</u>		<u>IgG</u>		<u>IgM</u>	
	OD	CV	OD	CV	OD	CV
Serum 1	0.100	n/a	0.101	n/a	0.389	n/a
Serum 2	0.576	3.9 %	0.659	7.3 %	0.983	3.5 %
Serum 3	1.107	5.9 %	1.246	5.4 %	1.372	2.4 %

Table 5: Intra-assay variation (n = 24)

<u>Intra-assay variation</u>	<u>IgA</u>		<u>IgG</u>		<u>IgM</u>	
	OD	CV	OD	CV	OD	CV
Serum 1	0.083	n/a	0.087	n/a	0.348	n/a
Serum 2	0.712	2.9 %	0.614	3.0 %	0.877	2.7 %
Serum 3	1.029	2.5 %	1.201	2.8 %	1.287	2.7 %

Table 6: Sensitivity and specificity in comparison with two other commercial ELISAs

	IgA	IgG	IgM
Sensitivity	100.0 %	100.0 %	100.0 %
Specificity	100.0 %	96.0 %	89.2 %

Table 7: Results from testing blood-donor sera taken from a blood donor center in Germany (n=212; \*n=200)

212 blood donor sera	*IgA	IgG	*IgM
negative	95.0 %	42.9 %	87.0 %
equivocal	2.5 %	2.4 %	3.5 %
positive	2.5 %	54.7 %	9.5 %

## References

1. Araj, G.F., et al.: Diagnostic value of ELISA for detection of *Candida albicans* cytoplasmic antigens in sera of cancer patients. *J. Clin. Microbiol.* 16: 46-59 (1982)
2. Crook, W.G.: *The Yeast Connection: A Medical Breakthrough*. P.O. Box 3494, Jackson, TN 38301. Professional Books (1983)
3. Haupt, H.M., et al.: Colonization and infection with *Trichosporon* species in the immunosuppressed host. *J. Infect. Dis.* 147: 199-203 (1983)
4. Iwata, K.: A review of the literature on drunken symptoms due to yeast in the gastrointestinal tract. In "Proceedings of the Second International Specialized Symposium on Yeast." Univ. of Tokyo Press, pp. 260-268 (1972)
5. Krause, W. et al.: Fungaemia and Funguria after oral administration of *Candida albicans*. *Lancet*: 598-599 (1969)
6. Meunier-Carpenter, F., Kiehn, T.E., Armstrong, D.: Fungaemia in the immunocompromised host: Changing patterns of antigenemia high mortality. *Amer. J. Med.* 71: 363-370 (1981)
7. Palacios, H.J.: Hypersensitivity as a cause of dermatologic and vaginal moniliasis resistant to topical therapy. *Ann. Allergy* 37: 110-113 (1976)
8. Ray, T.L.: Fungal infections in the immunocompromised host. *Med. Clin. No. Amer.* 64: 955-968 (1980)
9. Robinet, R.W.: Asthma due to *Candida albicans*. *Univ. Mich. Med. Ctr. Bull.* 12-15.
10. Stone, H.H., et al.: Alimentary tract colonization by *Candida albicans*. *J. Surg. Res.* 14: 273-276 (1973)
11. Stone, H.H., et al.: *Candida* sepsis; pathogenesis and principles of treatment. *Ann. Surg.* 179: 697-711 (1974)
12. Wingard, J.R., et al.: Pathogenicity of *Candida tropicalis* and *Candida albicans* after gastrointestinal inoculation in mice. *Infect. Immunol.* 29: 808-813 (1980)
13. Wingard, J.R., et al.: *Candida tropicalis*: A major pathogen in immunocompromised patients. *Ann. Int. Med.* 91: 539-543 (1979)
14. Witkins, S.S., et al.: Inhibition of *Candida albicans*: induced lymphocytes proliferation by lymphocytes and sera from woman with recurrent vaginitis. *Amer. J. Obstet. Gynecol.* 147: 809-811 (1983)
15. Wojdani, A., et al.: Measurement of humoral and cellular immunity for the diagnosis of Candidiasis. *Clin. Ecol.* 4: 210 (1986)