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Bordetella pertussis ViraStripe® IgA Test Kit

Stripe-Immunoblot for the qualitative detection of IgA antibodies against specific Bordetella species antigens in human serum.

The Bordetella pertussis ViraStripe® IgA Test Kit is an immunoblot based on an enzyme-immunoassay in the line/stripe format carrying the following purified Bordetella specific antigens: filamentous hemagglutinin (FHA) and pertussis toxin (PT)

Reactivity of the bands PT and FHA have been calibrated according to WHO standard sera and thus allow correlating the data measured to International Units per millilitre (3).

Principle of the assay

During the serum incubation step Bordetella specific IgA antibodies bind to the immobilised antigens on the test strip. During the conjugate reaction, AP-conjugate binds to the antigen-antibody complex. The alkaline phosphatase converts the chromogen/substrate and thus, stains the antigen-antibody complex on the test strip purple. The washing procedures following serum, conjugate and chromogen/substrate incubation steps remove unbound antibodies and reagents.

The green separation line divides the test strip into a control section and an analytical section. The control section contains the

negative control band, the serum control, three conjugate controls (IgG, IgA, IgM) and the cut off control.

The test strip code for Bordetella pertussis ViraStripe® IgA test strips is PA. Test strips are numbered from 01 to 50. The analytical section contains the Bordetella specific antigens.

V-BPSAOK Order No.: Order No.: V-BPSADK (Deca Kit) 10x 50 test strips 1x 50 test strips Kit size: Kit size. Specimen: 20 µl serum Specimen: 20 µl serum Time for testing: approx. 90 minutes Time for testing: approx. 90 minutes

Materials provided

Bordetella pertussis ViraStripe® Antigen Strips (IqA) 1x or 10x 50 test strips (Prod. No.: V-BPSAAS)

Test strips including a control section and Bordetella specific antigens in the analytical section, ready to use

ViraStripe® / ViraBlot® AP-Anti-Human IgA Conjugate 1x or 10x 9 ml (Order No.: V-UVNAKI)

Concentrate, goat ViraStripe® / ViraBlot® Diluent / Wash Buffer 1x or 10x 100 ml (Order No.: V-UVNUWP)

10x concentrate

ViraStripe® / ViraBlot® Diluent / Wash Powder 1x or 10x 5 g (Order No.: V-UVNUMP)

ViraStripe® / ViraBlot® Chromogen / Substrate Solution 1x or 10x 90 ml (Order No.: V-UVNUCS)

Ready to use

1 or 10 copies Evaluation Protocol for Bordetella pertussis ViraStripe® IgA Test Kit

Additionally available

Bordetella pertussis ViraStripe® IgA Positive Control 330 µl (Order No.: V-BPSAPK)

Human, ready to use

Bordetella pertussis ViraStripe® IgG,A,M Negative Control 330 µl (Order No.: V-BPSPNK)

Human, ready to use

Bordetella pertussis ViraStripe® IgA evaluation protocols 50 copies (Order No.: V-BPSAEP)

for automated interpretation with ViraScan® software

Preparation of reagents and patient samples

Bring all reagents to room temperature (20-25°C) prior to use. Information about stability can be found on page 5.

Diluent / Wash Buffer Dilute Diluent / Wash Buffer Concentrate 1:10 with distilled or deionised water (100 ml

Working Dilution: concentrate + 900 ml water). Add Diluent / Wash Powder completely and stir well until all powder is dissolved. If needed, place onto a magnetic stirrer for 10-15 minutes. The pH value should be

around pH 7.5 at 20°C.

Antigen Strips: Carefully separate the required number of test strips by use of forceps at the label and place the

test strips in the prepared incubation tray (see assay procedure, step 2). Use test strips directly after removing from packing. Do not touch test strips by hand. Return unused test strips directly

into the original packing, seal well and store at 2-8°C.

Patient samples: Use 20 µl patient serum undiluted per test strip.

Controls: Use 100 µl of Positive Control or 100 µl of Negative Control undiluted per test strip respectively.

Prepare Conjugate Concentrate 1:10 with Diluent / Wash Buffer Working Dilution (see table 1). **Conjugate Working Dilution:**

Prepare freshly prior to each test run. Do not store for further use.

Chromogen / Substrate

Solution:

Ready to use.



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Bordetella pertussis ViraStripe® IgA Test Kit

Preparation of Conjugate Working Dilution IgA

Freparation of Conjugate Working Dilution 194						
Final volume						
39.0 ml						
40.5 ml						
42.0 ml						
43.5 ml						
45.0 ml						
46.5 ml						
48.0 ml						
49.5 ml						
51.0 ml						
52.5 ml						
54.0 ml						
55.5 ml						
57.0 ml						
58.5 ml						
60.0 ml						
61.5 ml						
63.0 ml						
64.5 ml						
66.0 ml						
67.5 ml						
69.0 ml						
70.5 ml						
72.0 ml						
73.5 ml						
75.0 ml						

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 Table 1: 1:10 dilution of conjugate concentrate with Diluent / Wash Buffer Working Dilution

Assay procedure

- 1. Rinse incubation tray channels once with 1.5 ml Diluent / Wash Buffer Working Dilution, decant the liquid
- 2. Place the needed amount of test strips into the incubation tray one test strip per channel
- Add 1.5 ml Diluent / Wash Buffer Working Dilution and incubate by rocking for 5 minutes at room temperature (RT)
- Add 20 μl of each patient serum or 100 μl of each control
- 5. Incubate by rocking for 30 minutes at RT
- 6. Decant the liquid
- 7. 3 x washing:
 - add 1.5 ml Diluent / Wash Buffer Working Dilution
 - incubate by rocking for 5 minutes at RT
 - decant the liquid
- 8. Add 1.5 ml fresh Conjugate Working Dilution
- 9. Incubate by rocking for 15 minutes at RT
- 10. Decant the liquid
- 11. 3 x washing as in step 7
- 12. Add 1.5 ml distilled or deionised water and incubate by rocking for 1 minute at RT
- 13. Decant the liquid
- 14. Add 1.5 ml Chromogen / Substrate Solution
- 15. Incubate by rocking at RT

Bordetella pertussis ViraStripe® IgA: approx. 5 to 15 minutes Caution: Prolonged incubation causes background staining.

- 16. Stop the reaction by decanting the liquid
- 17. Wash 3 x with 1.5 ml distilled or deionised water
- 18. Dry test strips for interpretation

Mark the trays with water-resistant pen. Rinsing removes dust particles.

For each patient serum and each control, carefully separate one test strip by use of forceps at the label and place them into the incubation tray channels. The side showing the green separation line and the label must face up.

Make sure the test strips are completely covered with liquid. Use a 2D rocker with a rocking frequency of approx. 40/min. Avoid spilling of liquid. Do not decant the liquid after incubation.

Add patient sera and controls directly onto the labelled end of the test strips while the 2D rocker is running or make sure to tilt the incubation tray after adding each serum.

Make sure the test strips are completely covered with liquid. Use a 2D rocker with a rocking frequency of approx. 40/min.

Carefully tap the incubation tray on absorbent paper to remove the remaining liquid. Test strips adhere to the incubation tray when liquid is decanted.

Wash on the 2D rocker. Carefully tap the incubation tray on absorbent paper to remove the remaining liquid.

Make sure the test strips are completely covered with Conjugate Working Dilution

Make sure the test strips are completely covered with liquid. Use a 2D rocker with a rocking frequency of approx. 40/min.

Carefully tap the incubation tray on absorbent paper.

Wash on the 2D rocker.

Make sure the test strips are completely covered with liquid. Use a 2D rocker with a rocking frequency of approx. $40/\min$.

Carefully tap the incubation tray on absorbent paper.

Make sure the test strips are completely covered with liquid.

Stop the reaction as soon as the cut off control becomes visible. The Cut off control is located in the test strip control section. Caution: Prolonged incubation causes background staining.

Carefully tap the incubation tray on absorbent paper.

Wash without incubation time.

Carefully tap the incubation tray on absorbent paper to remove the remaining liquid. Place wet test strips with forceps on unbleached absorbent paper and allow to air dry before interpretation.

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Assay interpretation

1. Evaluation protocol:

Record data on the evaluation protocol. Glue the test strips on the evaluation protocol. Place the green separation line of the test strips exactly onto the separation line printed on the evaluation

2. Validity of test strips:

A test strip is considered as valid if the following bands are visible:

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- The serum control.

The conjugate control of the conjugate class being used. If more than one of the three conjugate controls become visible, the strongest band must indicate the appropriate conjugate class.

The cut off control.

and if the following band is not visible:

- The negative control band.

Do not assess invalid test strips!

3. Assignment of antigen

The green separation line of the test strips indicates position and orientation for the assignment of bands with the bandlocator on the evaluation protocol. Assign bands and record results according

4. Assessment of bands:

According to quality laboratory guidelines, the use of a cut off control for each run is recommended (4). The cut off control of the Bordetella pertussis ViraStripe® IgA is located in the control section on each test strip. The intensity of the cut off control indicates the threshold of which bands are being assessed:

A band is considered as distinct if its intensity is equal to or higher than the intensity of the cut off control. Mark bands with **X** in the evaluation protocol appropriately.

A band is considered as weak if its intensity is lower than the intensity of the cut off control. Mark bands with (X) in the evaluation protocol appropriately.

Caution: A band is not assessed if barely visible. A band is not assessed if not present.

Interpretation of patient

Patient bands have to be considered as symptoms of the disease. A final clinical diagnosis should always be made considering anamnesis, clinical manifestations and laboratory data.

Band PT (28 kD) is considered as highly specific for Bordetella pertussis and band FHA (220 kD) for Bordetella species.

IgA Interpretation criteria

General note: Distinct bands must have a minimum intensity (≥ cut off), which has to be determined by the cut off control. Weak bands have an intensity < cut off control. The cut off control is located in the control section of each test strip.

Identified bands	Result	Interpretation
Distinct PT band	Positive	PT-IgA antibodies against Bordetella pertussis detectable. This band pattern corresponds to a PT-IgA antibody concentration of about 12 IU/ml or greater. Following RKI guidelines this correlates with a once clearly increased IgA value (2), which provides an indication for recent contact with Bordetella pertussis (1). This band pattern might also be associated with a vaccine titer, especially if vaccination has recently occurred. However, IgA antibodies are rarely seen after vaccination (6,7).
Weak PT band	Equivocal Low PT-IgA antibody amount against Bordetella pertuss detectable. If an infection is further suspected, check for second patient sample after 2-4 weeks (1).	
No PT band	No PT-IgA antibodies against Bordetella pertu detectable. If an infection is further suspected, check a sec patient sample after 2-4 weeks (1).	
Distinct FHA band	Positive	FHA-IgA antibodies against Bordetella species detectable. Suspicion of recent contact with Bordetella species (8).
Weak FHA band	Equivocal	Low FHA-IgA antibody amount against Bordetella species detectable. If an infection is further suspected, check a second patient sample after 2-4 weeks (1).
No FHA band	Negative	No FHA-IgA antibodies against Bordetella species detectable. If an infection is further suspected, check a second patient sample after 2-4 weeks (1).



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IgG / IgA interpretation criteria of the pertussis toxin (PT) bands

PT-100	PT	PT	РТ	Interpretation of IgG und IgA results combination
IgG	IgG	ΙgΑ	assessment	
x	x	x (x) Ø	Positive	Indication for recent contact with Bordetella pertussis (1,2,5). This band pattern might also be associated with a vaccine titer, especially if
(x) Ø	x (x) Ø	x	Positive	vaccination has occurred less than 12 months ago. However, IgA antibodies are rarely seen after vaccination (6,7).
(x)	x	(x) Ø	Positive	Suspicion of recent contact with Bordetella pertussis. If an infection is further suspected, check a second patient sample after 2-4 weeks (1).
Ø	x	(x) Ø	Positive Suspicion of recent contact with Bordetella pertussis or vaccine titer. very early infection may not be excluded. If an infection is furth suspected, check a second patient sample after 2-4 weeks (1).	
(x) Ø	(x) Ø	(x)	Equivocal	If an infection is further suspected, check a second patient sample after 2-4 weeks (1).
Ø	(x) Ø	Ø	Negative	No indication for an infection with Bordetella pertussis or a vaccine titer.

Table 2: Results of PT bands of Bordetella pertussis ViraStripe[®] IgG, IgA and their laboratory diagnostic evaluation. Legend: X = X distinct band; X = X weak band; X = X bands of the band constellations are marked in grey.

IgG / IgA interpretation criteria of the filamentous hemagglutinin (FHA) bands

lgG FHA	lgA FHA	FHA assessment	Interpretation of IgG und IgA results combination
(x) Ø	x	Positive	Suspicion of recent contact with Bordetella species (8).
х	(x) Ø	Positive	Suspicion of vaccine titer or past infection (1).
(x) Ø	(x)	Equivocal	If an infection is further suspected, check a second patient sample after 2-4 weeks (1).
(x) Ø	Ø	Negative	No indication for an infection with Bordetella pertussis or a vaccine titer.

Table 3: Results of FHA bands of Bordetella pertussis ViraStripe[®] IgG, IgA and their laboratory diagnostic evaluation. Legend: x = distinct band; (x) = weak band; (x) = months are marked in grey.



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IgA test strip

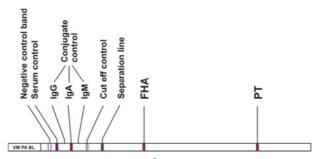


Figure 1: Schematic drawing of a Bordetella pertussis ViraStripe® IgA test strip in full scale.

Nomenclature and description of Bordetella bands from literature

Antigen: Comment:

FHA (220 kD)

Filamentous Hemagglutinin

Specific for Bordetella species: IgG antibodies against FHA appear in 80-90% of infected patients, whereas IgA antibodies appear in 50-60% of infected patients (9). Antibodies to FHA are developed after vaccination and after infection with Bordetella pertussis or Bordetella parapertussis.

PT (28 kD)
Pertussis Toxin

Highly specific for Bordetella pertussis. IgG antibodies against PT appear in more than 90% of infected patients, whereas IgA antibodies appear in 40-50% of infected patients (9). Antibodies against PT are developed after vaccination and after infection with Bordetella pertussis but not after infection with Bordetella parapertussis. The PT-IgA band is calibrated with International WHO standards and when present in cut off intensity correlates with a value of about 12 IU/ml (3,12). Following RKI guidelines, a once clearly increased IgA value presents supportive evidence for a recent contact with Bordetella pertussis (1). This value corresponds to a distinct PT-IgA band.

Diagnostic significance of antibodies against Bordetella pertussis

1. IgG antibodies appear 15-20 days after beginning of the disease (Stadium convulsivum). They are not detectable in the early stage of the infection (13). IgG antibodies can persist more than 10 years, but at least 6 months after beginning of the disease (13,14). Therefore patients in the second (Stadium convulsivum) or third (Stadium decrementi) stage of the disease are mostly positive for IgG antibodies. Antibody titers steadily decrease in convalescence (15). Infants can acquire maternal IgG antibodies diaplacentally (9, 16).

As proof for an infection with Bordetella pertussis, the Robert Koch Institute (RKI) recommends for serological testing methods a once clearly increased value of at least 100 IU/ml for PT-IgG antibodies (1,2). This value correlates with a distinct PT-100 band on the Bordetella pertussis ViraStripe® IgG. Serological indication for recent contact with Bordetella pertussis is possible, if vaccination has occurred more than 12 months ago (1).

2. IgM antibodies usually appear 8-15 days after beginning of the disease (13) and reach their highest concentration after approx. 8-10 weeks (15). IgM antibodies are detectable in more than 90% of infected patients between the days 20 and 50 after beginning of the disease. IgM titers may be elevated after vaccination (17). In singular cases IgM antibodies may appear only weak, delayed or not at all in infants and adults (14).

3. IgA antibodies are nearly exclusively detectable after natural infection and only in very rare cases after vaccination (6,7). IgA antibodies reach their highest concentration approx. 8-10 weeks after beginning of the disease (15). IgA antibodies are generally not longer detectable than 6 months after infection (13). In the first months of life infants do not - or only in a low range — develop IgA antibodies. Therefore infants should be checked for IgM antibodies (17).

There are indications for persisting of Bordetella pertussis specific IgA antibodies in the population caused by subclinical infections (17).

As proof for an infection with Bordetella pertussis, the Robert Koch Institute (RKI) recommends for serological testing methods a once clearly increased value of at least 12 IU/ml for PT-IgA antibodies (1,2). This value correlates with a distinct PT band on the Bordetella pertussis ViraStripe® IgA.

- **4.** Detection of antibodies against pertussis toxin (PT) is specific for Bordetella pertussis (9,15,16,18).
- **5.** Medication and immunoglobulin therapy can cause unspecific antibody reactions (19).
- **6.** Cross reactions with FHA are known for infections with M. pneumoniae, C. pneumoniae und other bacteria (7).



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IgA performance data

Analysis of sensitivity and specificity:

Sensitivity of the Bordetella pertussis ViraStripe® IgA Test Kit has been determined by analysing WHO standards, containing a defined amount of anti-PT and anti FHA antibodies, measured in International Units per millilitre (IU/mI) (5).

The PT band shows the following reactivity: a distinct band starts at about 12 IU/ml, based on anti-PT IgA antibodies.

The FHA band shows the following reactivity: a distinct band starts at about 40 IU/ml, based on anti-FHA IgA antibodies. A weak band starts at about 10 IU/ml.

Reactivity of the Bordetella pertussis ViraStripe® IgA Test Kit has been determined by analysing 145 unselected blood donors.

Bordetella pertussis ViraStripe® lgA	Positive with a PT band, % (n)	Positive with a FHA band, % (n)
Blood donors (n= 145)	2% (3)	29% (42)

Table 4: Blood donor analysis with Bordetella pertussis ViraStripe® IgATest Kit

Scientific studies demonstrate the presence of anti-PT IgA antibodies in blood donor sera in 2% of all cases, showing at least the "minimal level of quantitation" (12 IU/ml) (12). This level correlates to a distinct Bordetella pertussis ViraStripe® IgA PT band. Analysis of 145 unselected blood donor sera with the Bordetella pertussis ViraStripe® IgA Test Kit shows as well in 2% of all cases a positive result with the PT band (see table 4).

Reference studies demonstrate the presence of anti-FHA IgA antibodies in blood donor sera in 58% of all cases, showing at least the "minimal level of quantitation" (10 IU/ml) (12). Analysis of 145 unselected blood donor sera with the Bordetella pertussis ViraStripe® IgA Test Kit shows in 29% of all cases an at least distinct FHA band (20 IU/ml; see table 4).

Warnings and precautions

- 1. All human serum components were tested for HCV, HIV1,2 antibodies and HBs antigens and found to be negative. Nevertheless, all human kit components as well as the patient samples should be considered as potentially infectious and handled according to safety precautions. While working with potentially infectious/hazardous materials, all national and international rules, regulations, guidelines and laws must be taken into account. This also applies to storage and disposal of chemicals and reagents being used.
- 2. While working with hazardous or toxic substances/ biological agents precautions have to be applied following national biosafety regulations. In general, biological and chemical agents should be handled according to "Good Laboratory Practice (GLP)" guidelines. Precautions among others are:
- Do not pipette by mouth.
- Wear disposable gloves and safety glasses while working.
- Do not eat, drink or smoke in the working area.

- 3. The chromogen/substrate solution contains BCIP and NBT. Avoid contact with skin and mucous membranes. In case of contact with skin and eyes wash immediately with large quantities of water.
- 4. Samples and all potentially contaminated materials must be decontaminated using validated laboratory techniques, e.g. by autoclaving 20 minutes at 121°C under humid conditions. Liquid disposals can be mixed with sodium hypochlorite to a final concentration of 1% sodium hypochlorite. Incubate 30 min for complete disinfection.
- 5. Please refer to material safety data sheets for detailed information on potential risks, first aid guidelines, accidental release measures, handling and storage recommendations, personal protective equipment, directions for disposal and indications to toxicology.

Storage and stability of reagents

- 1. Test strips: In closed bags stable until the expiration date if stored at
- 2. Conjugate Concentrate: Stable until the expiration date if stored at
- 3. Conjugate Working Dilution: Prepare freshly prior to each run. Do not store for further use
- 4. Diluent / Wash Buffer Concentrate, 10x: Stable until the expiration date if stored at 2-8°C.
- 5. Diluent / Wash Buffer Working Dilution: Stable for 2 weeks if stored at 2-8°C. For longer storage, aliquot and freeze at -20°C
- 6. Diluent / Wash Powder: Stable until the expiration date if stored at 2-
- 7. Chromogen / Substrate Solution: Stable until the expiration date if stored at 2-8°C. Avoid exposure to light!

Specimen indications

- 1. The Bordetella pertussis ViraStripe® IgA Test Kit must be used with human serum.
- 2. Only clear, non-hemolysed, non-microbially contaminated specimens must be used.
- 3. Using icteric, lipemic, hemolytic and/or heat-inactivated serum may lead to false results

Limitation of the procedure

- $\textbf{1.} \ \mathsf{To} \ \mathsf{ensure} \ \mathsf{reliable} \ \mathsf{results}, \ \mathsf{follow} \ \mathsf{carefully} \ \mathsf{the} \ \mathsf{Instruction} \ \mathsf{for} \ \mathsf{Use} \ \mathsf{and}$ "Good Laboratory Practice".
- 2. A positive result is based on elevated specific antibody titers and should be considered as a symptom. The correlation to a disease is only conditionally possible.
- 3. A negative result does not exclude a contact with the pathogen or the presence of a disease.

 4. Adequately trained personnel only should perform the assay
- procedure.

- 4. Normally, human serum can be stored up to 5 days at 2-8°C. Specimens may be stored at -20°C (or below) for long term storage. 5. Prior test processing, specimens should have reached room
- temperature. Mix specimens carefully after thawing. Precipitates in specimens can be removed by centrifugation.
- 6. Avoid multiple freeze and thaw cycles.
- 5. The detection of specific antibodies can vary within different assays from different manufacturers and can lead to different results due to different sensitivity, specificity and assay methodologies.
- 6. Test strips showing a high background level should not be interpreted, especially if band intensities are lighter than the background level.
- 7. In vitro diagnostics must not be used beyond expiration date as reliable results may not be possible.
- 8. Efficient washing after each incubation step is essential for consistent results; insufficient washing may lead to false results.



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Bordetella pertussis ViraStripe® IgA Test Kit

Literature

ROBERT KOCH INSTITUT: Bundesgesundheitsblatt 2013

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- ROBERT KOCH INSTITUT: Blundesgesundnetsbiatt 2013
 ROBERT KOCH INSTITUT: Themen zum Meldewesen Infobrief 39 (2013)
 XING, D. et al.: Characterization of reference materials for human antiserum to pertussis antigens by an international collaborative study. Clin. Vaccine Immunol. 16(3):303-11 (2009)
 RILL-BÅK: Båk-Richtlinie zur Qualitätssicherung quantitativer laboratoriumsmedizinischer Untersuchungen. (2008), www.bundesaerztekammer.de
 RIFFELMANN, M. et al.: Pertussis nicht nur eine Kinderkrankheit. Deutsches Ärzteblatt, Jg. 105, Heft 97, (2008)
 HENDRIKX. L.H. et al.: Serum IgA Responses against Pertussis Proteins in Infected and Dutch wP or aP Vaccinated Children: An Additional Role in Pertussis Diagnostics. PlosONE

- HENDRIKX. L.H. et al.: Serum IgA Responses against Pertussis Proteins in Infected and Dutch wP or aP Vaccinated Children: An Additional Role in Pertussis Diagnostics. PlosONE 2011; 11 (6)

 MERRIGAN, SD. et al.: Comparison of Western Immunoblotting to an Enzyme-Linked Immunosorbent Assay for the determination of Anti-Bordetella pertussis Antibodies. Clin Vaccine Immunol. 2011 Apr;18(4):815-20.

 WIRSING VON KÖNIG, CH. Konsiliarlabor für Bordetellen, Krefeld: http://labor-krefeld.de/www/Hygiene/alpha1/htm/VIVI_SA_PT_FHA_E_02.htm. 2012 Dez

 MEADE, B. D. et al.: Seroidagnosis of pertussis, p. 322. In: Manclark CR: Proc. 6th Intl. Symp. Pertussis. DHHS (FDA) Publication No. 90-1164; Bethesda, MD, (1990)

 de MELKER, H. E. et al.: Specificity and sensitivity of high levels of immunoglobulin G antibodies against pertussis toxin in a single serum sample for diagnosis of infection with Bordetella pertussis. J. Clin. Microbiol. 38(2):800-6 (2000)

 BAUGHIMAN, A. L. et al.: Establishment of diagnostic cutoff points for levels of serum antibodies to pertussis toxin, filamentous hemagglutinin, and fimbriae in adolescents and adults in the United States. Clin. Diagn. Lab. Immunol. 11(6):1045-53 (2004)

 SAEMANN-ISCHENKO, G. et al.: Stabilishment of diagnostic outoff points for levels of serum antibodies to pertussis toxin, filamentous hemagglutinin, and fimbriae in adolescents and adults in the United States. Clin. Diagn. Lab. Immunol. 11(6):1045-53 (2004)

 SAEMANN-ISCHENKO, G. et al.: Stabilishment of diagnostic evertella Antigens in German Adults. Eur. J. Clin. Microbiol. Infect. Dis. 20:850-853 (2001)

 RAPP, J. et al.: Diagnosticsche Verfahren zum Nachweis einer Pertussis-Infektion. Ärzfl. Lab. 34:181-189 (1988)

 BIBER M, Enders G, Pertussisverdacht und Labordiagnose. Ärzll. Lab. 34:97-102 (1988)

 WIRSING VON KÖNIG, C. H.: Labordiagnostik des Keuchhustens. GI Labor-Medizin 6:407-410 (1985)

 GUISO, N. et al.: Westermblot analysis of antibody responses of young infants pertussis infection. Eur. J. Clin. Microbiol. Infect. Dis. 9. 10.
- 11.

- THOMAS, L.: Labor und Diagnose. Med. Verlagsgesellschaft Marburg (2008)

Symbols used

***	Manufacturer	REF	Order Number
Ţį.	Refer to Instructions for Use	Χ	Use by / Expiration Date
IVD	In-Vitro Diagnostic Medical Device		Temperature Limitation (Storage)
LOT	Lot Number	CONTROL +	Positive Serum Control
\sum_{50}	Sufficient for 50 Tests	CONTROL -	Negative Serum Control
	Room Temperature in °C	CONTROL	Control
ŕ	Person in Charge	DATE	Date
#	Serum Number	USUBSTRATE	Chromogen/Substrate Incubation Time in Minutes
PROTOCOL	Evaluation Protocol	Nº	Protocol Number