Test Definition: ASPBA

Aspergillus Antigen, Bronchoalveolar Lavage

Overview

Useful For

Aiding in the diagnosis of invasive aspergillosis using bronchoalveolar lavage specimens

Assessing response to therapy

Method Name

Enzyme Immunoassay (EIA)

NY State Available

Yes

Specimen

Specimen Type

Lavage

Ordering Guidance

For serum specimens, order ASPAG / *Aspergillus* (Galactomannan) Antigen, Serum.

Specimen Required

Container/Tube: Sterile, leak-proof container

Note: Specimen trap collection containers (with suction catheters attached) will be rejected due to high-risk of leakage and contamination upon opening. Avoid use of these for bronchoalveolar lavage specimens.

Specimen Volume: 2 mL

Additional Information: If specimen transfer into an acceptable sterile container is necessary, perform specimen transfer in a biosafety cabinet. Place container in separate sealed plastic bag.

Forms

If not ordering electronically, complete, print, and send Infectious Disease Serology Test Request (T916) with the specimen.

Specimen Minimum Volume

1.5 mL

Reject Due To

Bronchial washing	Reject
Thick/viscous/ mucoid	Reject

specimens	
Specimen in a non-leak proof container	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Lavage	Refrigerated (preferred)	14 days	
	Frozen	14 days	

Clinical & Interpretive

Clinical Information

Invasive aspergillosis (IA) is a severe infection that occurs in patients with prolonged neutropenia following transplantation or in conjunction with aggressive immunosuppressive regimens (eg, prolonged corticosteroid use, chemotherapy). The incidence of IA is reported to vary from 5% to 20% depending on the patient population. IA has an extremely high mortality rate of 50% to 80%, due in part to the rapid progression of the infection (ie, 1-2 weeks from onset to death). Approximately 30% of cases remain undiagnosed and untreated at death.

Definitive diagnosis of IA requires histopathological evidence of deep-tissue invasion or a positive culture. This evidence is often difficult to obtain due to the critically ill nature of the patient and the fact that severe thrombocytopenia often precludes the use of invasive procedures to obtain a quality specimen. The sensitivity of culture in this setting is low, reportedly ranging from 30% to 60% for bronchoalveolar lavage (BAL) fluid. Accordingly, the diagnosis is often based on nonspecific clinical symptoms (unexplained fever, cough, chest pain, dyspnea) in conjunction with radiologic evidence (computed tomography scan); a definitive diagnosis is often not established before fungal proliferation becomes overwhelming and refractory to therapy.

Recently, a serologic assay was approved by the US Food and Drug Administration for the detection of galactomannan, a molecule found in the cell wall of *Aspergillus* species. Serum galactomannan (*Aspergillus* antigen) can often be detected a mean of 7 to 14 days before other diagnostic clues become apparent, and monitoring of *Aspergillus* antigen can potentially allow initiation of preemptive antifungal therapy before life-threatening infection occurs.

The clinical utility of *Aspergillus* antigen testing in BAL specimens as an early prognostic indicator of IA has recently been assessed. These studies demonstrated equivalent or higher sensitivity compared to detection of *Aspergillus* antigen in serum.(1-4) This assay may be useful in the assessment of therapeutic response as antigen levels typically decline in response to effective antimicrobial therapy.

Reference Values

<0.5 Index

Interpretation

A positive result in bronchoalveolar lavage (BAL) fluid supports a diagnosis of invasive, pulmonary aspergillosis. Positive results should be considered in conjunction with other diagnostic procedures, such as microbiologic culture, histological

examination of biopsy specimens, and radiographic evidence (see Cautions).

A negative result in BAL fluid does not rule out the diagnosis of invasive aspergillosis (IA). Patients at risk of IA should be monitored twice a week for *Aspergillus* antigen levels in serum until determined to be clinically unnecessary.

Aspergillus antigen levels typically decline in response to effective antimicrobial therapy.

Cautions

False-positive results are reported to occur at rates of 8% to 14% with this assay when performed on serum. Numerous foods (eg, pasta, rice, etc) contain galactomannan. It is thought that damage to the gut wall by cytotoxic therapy, irradiation, or graft-versus-host disease enables translocation of the galactomannan from the gut lumen into the blood and may be partially responsible for the high false-positive rate of this assay when serum is tested. Whether false-positive results in bronchoalveolar lavage (BAL) fluid are associated with the consumption of certain foods, as is observed in serum samples, remains to be determined.

Other genera of fungi such as *Penicillium* and *Paecilomyces* have shown reactivity with the rat EBA-2 monoclonal antibody used in the assay. These species are rarely implicated in invasive fungal disease. Specimens containing *Histoplasma* antigen may cross-react in the *Aspergillus* antigen assay. Cross-reactivity with *Alternaria* species has also been reported.

The specificity of the assay for *Aspergillus* species cannot exclude the involvement of other fungal pathogens with similar clinical presentations such as *Fusarium*, *Alternaria*, and *Mucorales*.

The performance of the assay has not been evaluated other specimen types such as urine or cerebrospinal fluid.

The assay may exhibit reduced detection of *Aspergillus* antigen in patients with chronic granulomatous disease or autosomal dominant hyper-IgE syndrome (formerly known as Job syndrome).

The concomitant use of antifungal therapy in some patients with invasive aspergillosis may result in reduced sensitivity of the assay.

False-positive results are possible in patients receiving PLASMA-LYTE for intravenous hydration or if PLASMA-LYTE is used during bronchoscopy for the collection of BAL fluid.

Potential false-positive results exhibited with serum specimens when digestive enzymes of fungal origin, like Nortase, are used for enzyme substitution therapy in exocrine pancreatic insufficiency in intensive care unit patients.(5)

Supportive Data

In clinical studies submitted to the US Food and Drug Administration, the sensitivity of the test for serum was reported to be 81% for proven or probable invasive aspergillosis (n=31 patients), and the specificity was 89% (n=148 patients). The positive and negative predictive values were reported as 68% and 96% respectively, based on an average prevalence of 14% in the study population. In a low prevalence population (5%), the positive predictive value decreases to 31%; the negative predictive value remains at 96%.(Package insert: Platelia Aspergillus EIA. Bio-Rad; 06/2003)

Accuracy:
The performance characteristics of the Platelia *Aspergillus* enzyme immunoassay (EIA) for the detection of

galactomannan in bronchoalveolar lavage (BAL) fluid were validated at Mayo Clinic Laboratories by comparison of results obtained from an outside reference laboratory using the same assay. These studies demonstrated 95.6% (240/251) agreement between sites (Table 1).

Table 1. Comparison of Platelia *Aspergillus* Antigen results at Mayo Clinic Laboratories and an outside reference laboratory using BAL fluid (n=251).

	Outside reference lab *Aspergillus* antigen result	
MCL *Aspergillus* antigen result	Positive	Negative
Positive	24	1
Negative	10	216

Percent Agreement: 95.6% (240/251) (95% Cl; 92.2-97.6)
Kappa value: 0.79

For 10 of the 11 discordant results, testing at Mayo Clinic Laboratories correlated with either serum *Aspergillus* antigen levels or fungal culture.

Precision:
Intra- and interassay precision was tested for negative, midrange and high-positive, and spiked BAL specimens. The mean index values, standard deviation and percent coefficient of variation were all acceptable, indicating excellent precision. (Tables 2 and 3)

Table 2. Intra-assay precision studies

	Mean index	**Standard deviation**	**% Coefficient of variation**
Negative	0.23	0.05	22.1
Mid-positive	2.23	0.16	6.9
High positive	4.29	0.43	9.9

Positive: >0.5
Negative: <0.5

Table 3. Inter-assay precision studies

	Mean index	**Standard deviation**	**% Coefficient of variation**
Negative	0.20	0.05	25.5
Mid-positive	2.32	0.39	17.1
High positive	4.45	0.84	18.9

Positive: >0.5
Negative: <0.5

Analytical Specificity:
Cross-reactivity studies were performed by testing analyte-negative BAL specimens that had been spiked with varying concentrations of positive control material for the following organisms: *Histoplasma capsulatum*, *Blastomyces dermatitidis*, or *Cryptococcus neoformans*. These studies demonstrated that high concentrations of *Histoplasma* and *Blastomyces* antigen in BAL may yield positive results by the Platelia *Aspergillus* antigen assay. This has been

demonstrated in prior published studies,(5) and it is a known limitation of this test that there may be cross-reactivity with dimorphic fungal pathogens.

In addition to the studies above, an analyte-negative BAL specimen was spiked with a pleural fluid that was known to be positive for *Streptococcus pneumoniae* antigen. This spiked- specimen was tested by the Platelia assay and was negative at all dilutions tested.

Clinical Reference

1. Park SY, Lee SO, Choi SH, et al. Aspergillus galactomannan antigen assay in bronchoalveolar lavage fluid for diagnosis of invasive pulmonary aspergillosis. J Infect. 2010;61(6):492-498
2. Husain S, Clancy CJ, Nguyen MH, et al. Performance characteristics of the platelia aspergillus enzyme immunoassay for detection of Aspergillus galactomannan antigen in bronchoalveolar lavage fluid. Clin Vaccine Immunol. 2008;15(12):1760-1763
3. Meersseman W, Lagrou K, Maertens J, et al. Galactomannan in bronchoalveolar lavage fluid: a tool for diagnosing aspergillosis in intensive care unit patients. Am J Respir Crit Care Med. 2008;177(1):27-34
4. Becker MJ, Lugtenburg EJ, Cornelissen JJ, Van Der Schee C, Hoogsteden HC, De Marie S. Galactomannan detection in computerized tomography-based bronchoalveolar lavage fluid and serum in haematological patients at risk for invasive pulmonary aspergillosis. Br J Haematol. 2003;121(3):448-457
5. Schroeder I, Dichtl K, Liebchen U, et al. Digestive enzymes of fungal origin as a relevant cause of false positive Aspergillus antigen testing in intensive care unit patients. Infection. 2021;49(2):241-248. doi:10.1007/s15010-020-01506-4
6. Xavier MO, Pasqualotto AC, Cardoso ICE, Severo LC. Cross-reactivity of Paracoccidioides brasiliensis, Histoplasma capsulatum, and Cryptococcus species in the commercial Platelia Aspergillus enzyme immunoassay. Clin Vaccine Immunol. 2009;16(1):132-133
7. Thompson GR, Patterson TF: *Aspergillus* species. In: Bennett JE, Dolin R, Blaser MJ, eds. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases. 9th ed. Elsevier; 2020:3103-3116

Performance

Method Description

The Platelia *Aspergillus* enzyme immunoassay) is a 1-stage immunoenzymatic sandwich microplate assay that detects galactomannan in bronchoalveolar lavage specimens. The assay uses the rat monoclonal antibody EBA-2, which is directed against *Aspergillus* galactomannan. The monoclonal antibody is used to coat the wells of the microplate and bind the antigen and as the detector antibody in the conjugate reagent (peroxidase-linked monoclonal antibody).

Samples are heat-treated in the presence of EDTA to dissociate immune complexes and to precipitate proteins that could possibly interfere with the test. The treated samples and conjugate are added to the wells coated with the monoclonal antibody and incubated. A monoclonal antibody-galactomannan-monoclonal antibody/peroxidase complex is formed in the presence of *Aspergillus* antigen.

The strips are washed to remove any unbound material, and the substrate solution is added, which will react with the complex bound to the well to form a blue color reaction. The enzyme reaction is stopped by the addition of acid, which changes the blue color to yellow. The optical absorbance of specimens and controls is determined with a

spectrophotometer set at 450 nm and 620/630 nm wavelengths.

Negative, cutoff (low-positive), and high-positive controls are analyzed each time the assay is performed. The presence or absence of *Aspergillus* (galactomannan) antigen in the test sample is determined by calculation of an index for the specimen. The index is the optical density (OD) value of the specimen divided by the mean OD of wells containing the cutoff control serum (low-positive control).(Package insert: Platelia *Aspergillus* EIA. Bio-Rad Laboratories; 10/2020)

PDF Report
No

Day(s) Performed
Monday through Friday, Sunday

Report Available
1 to 2 days

Specimen Retention Time
14 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Superior Drive

Fees & Codes

Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification
This test has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information
87305

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
ASPBA	Aspergillus Ag, BAL	62467-6

Result ID	Test Result Name	Result LOINC® Value
61009	Aspergillus Ag, BAL	62467-6