Test Definition: PNTOR

S. pneumoniae IgG Ab, with reflex,S

Overview

Useful For

Assessing the IgG antibody response to active immunization with nonconjugated 23-valent vaccines

Assessing the IgG antibody response to active immunization with conjugated 13-valent and 7-valent vaccines

Determining the ability of an individual to produce an antibody response to polysaccharide antigens, as part of an evaluation for humoral or combined immunodeficiencies

Testing Algorithm

If the result is 41.0 mcg/mL or greater and less than 181.0 mcg/mL, then *Streptococcus pneumoniae* IgG antibodies for 23 serotypes will be performed at an additional charge.

Reflex Tests

Test Id	Reporting Name	Available Separately	Always Performed
PN23	S. pneumoniae IgG Ab,23 serotypes,S	Yes	No

Method Name

Enzyme-Linked Immunosorbent Assay (ELISA)

NY State Available

Yes

Specimen

Specimen Type

Serum

Ordering Guidance

This test is the preferred test for patients being evaluated for possible immunodeficiency or for assessment of pneumococcal vaccination response (initial evaluation).

The preferred test for patients previously tested for *Streptococcus pneumoniae* antibodies (as part of follow up testing or part of pre/post vaccine assessment) is PNTO / *Streptococcus pneumoniae* IgG Antibodies, Total, Serum.

The preferred test for patients previously tested for *S pneumoniae* serotypes (as part of follow up testing or part of pre/post vaccine assessment) is PN23 / *Streptococcus pneumoniae* IgG Antibodies, 23 Serotypes, Serum.

Specimen Required

Container/Tube:

Preferred: Serum gel

Acceptable: Red top

Specimen Volume: 0.5 mL

Reject Due To

Gross hemolysis	OK
Gross lipemia	OK
Gross icterus	OK
Heat-inactivated specimen	Reject

Specimen Minimum Volume

0.3 mL

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	21 days	
	Frozen	21 days	

Clinical & Interpretive

Clinical Information

Streptococcus pneumoniae is a gram-positive bacterium that causes a variety of infectious diseases in children and adults. These include invasive disease (bacteremia and meningitis) and infections of the respiratory tract (pneumonia and otitis media). There is an annual estimated number of 5000 cases of pneumococcal bacteremia (without pneumonia) with a fatality rate of approximately 20%, reaching as high as 60% in the elderly population. It is estimated that as many as 400,000 hospitalizations from pneumococcal pneumonia occur annually in the United States, with a case-fatality rate of 5% to 7%.

More than 90 serotypes of *S pneumoniae* have been identified, based on varying polysaccharides that are found in the bacterial cell wall. The serotypes responsible for disease vary with age and geographic location.

Bacterial polysaccharides induce a T-cell independent type II humoral immune response. Vaccines containing bacterial polysaccharides can be effective in generating an immune response that results in production of IgG antibodies and generation of long-lived plasma and memory B cells, which can protect an individual against bacterial disease.

Active immunization is performed with a nonconjugated polysaccharide vaccine (Pneumovax) that contains a total of 23 serotypes, namely 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F, and 33F. These 23 serotypes were included because, as a group, they account for approximately 90% of invasive pneumococcal infections. This nonconjugated vaccine is indicated for all adults 65 years of age and older, individuals between 2 and 64 years with chronic diseases (heart disease, lung disease, type I diabetes, liver disease), those who are immunocompromised (congenital or acquired immunodeficiencies, malignancy, solid-organ transplant), those with functional or anatomic asplenia, and adults 19 to 64 years who smoke. Because not all patients can generate a robust T-cell independent antibody response, conjugated vaccines such as Prevnar (7-valent) and Prevnar 13 (13-valent) were developed, in which the polysaccharide is conjugated to the CRM197 protein and therefore initiates a T-cell dependent antibody response. Immunization with the conjugated vaccine is indicated in all children under 2 years old, all adults 65 years and older, and individuals with medical conditions such as immunodeficiency, chronic obstructive pulmonary disease, and congestive heart failure.

Antibody responses develop in approximately 75% to 85% of nonimmunocompromised adults and older children approximately 4 to 6 weeks following immunization.

Reference Values

> or =9.7 mcg/mL

Interpretation

Low antipneumococcal antibody concentrations (<9.7 mcg/mL) indicate a poor response to the pneumococcal vaccine, while high concentrations (>270.0 mcg/mL) indicate a robust vaccine response. Results falling in the modest (9.7-40.9 mcg/mL), intermediate (41.0-180.9 mcg/mL), and moderate (181.0-270.0 mcg/mL) categories may warrant serotype-specific antibody testing, to be determined at the discretion of the physician.

When comparing pre- and post-vaccination samples, an increase in antibody concentrations is generally considered to be indicative of a normal vaccine response. However, the specific fold increase is influenced substantially by the antibody concentration observed in the pre-vaccination sample.

Cautions

Protective concentrations of IgG antibodies, or those required to prevent infection from *Streptococcus pneumoniae,* have not been defined.

Quantitation of the IgG antibody response to pneumococcal serotypes does not provide any information on their functional capacity (opsonization efficiency).

Clinical Reference

1. Parker AR, Lock E, Iftikhar A, et al: Purification and characterization of anti-pneumococcal capsular polysaccharide IgG immunoglobulins. Clin Biochem. 2017 Jan;50(1-2):80-83

2. Parker AR, Park MA, Harding S, Abraham RS: The total IgM, IgA and IgG antibody responses to pneumococcal polysaccharide vaccination (Pneumovax23) in a healthy adult population and patients diagnosed with primary immunodeficiencies. Vaccine. 2019 Feb 28;37(10):1350-1355

3. Moffitt KL, Malley R: Next generation pneumococcal vaccines. Curr Opin Immunol. 2011 June;23(3):407-413

4. Paradiso PR: Advances in pneumococcal disease prevention: 13-valent pneumococcal conjugate vaccine for infants and children. Clin Infect Dis. 2011 May;52(10):1241-1247

5. Daly TM, Hill HR: Use and clinical interpretation of pneumococcal antibody measurements in the evaluation of humoral immune function. Clin Vaccine Immunol. 2015 Feb;22(2):148-152

6. Reynolds MM, Murray DL, Willrich MAV, et al: Total vs antigen specific pneumococcal antibody response: A comparison of two different assay types. Clin Chem. 2015 Oct;61(10):S77

Performance

Method Description

Pneumococcal capsular polysaccharide (PCP) antibodies bind to the wells of a microwell plate pre-coated with PCP antigen (1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19F, 19A, 21, 22F, 23F, 33F). Calibrators and controls are pre-adsorbed with C-polysaccharide (CPS) and samples are diluted in a diluent containing CPS. The calibrators, controls, and patient samples are added to the wells and antibodies recognizing the PCP antigen bind during the first incubation. After washing the wells to remove all unbound proteins, purified peroxidase labelled rabbit anti-human IgG (gamma-chain specific) conjugate is added. The conjugate binds to the captured human antibody and the excess unbound conjugate is removed by another wash step. The bound conjugate is incubated with 3,3',5,5'-tetramethylbenzidine (TMB) substrate, which gives a blue reaction product. The enzyme reaction is stopped by adding phosphoric acid, which produces a yellow end point color and is read at 450nm. The optical density (OD) of the solution at 450 nm is directly proportional to the concentration of antibody in the sample. The standard curve is established by plotting the antibody concentrations of the calibrators (x-axis) and their corresponding measured OD

values (y-axis).(Package insert: VaccZyme Anti-PCP IgG Enzyme Immunoassay Kit. The Binding Site; MK012.U, Rev. 6, 11/2015)

PDF Report
No

Specimen Retention Time
12 weeks

Performing Laboratory Location
Rochester

Fees & Codes

Test Classification
This test was developed, and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. This test has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information
86317

86317 x 23 (if appropriate)

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
PNTOR	S. pneumoniae IgG Ab, with reflex,S	43236-9

Result ID	Reporting Name	LOINC®
PNTOR	S. pneumoniae IgG Ab, with reflex,S	43236-9