MAYO CLINIC LABORATORIES

Test Definition: TPBF

Protein, Total, Body Fluid

Overview

Useful For

Identification of exudative pleural effusions

Differentiating hepatic from other causes of ascites that have elevated serum ascites albumin gradient using peritoneal fluid

Method Name

Colorimetric

NY State Available

No

Specimen

Specimen Type

Body Fluid

Ordering Guidance

For protein measurement in spinal fluid specimens, order TPSF / Protein, Total, Spinal Fluid. Testing will be changed to TPSF if this test is ordered on that specimen type.

Necessary Information

1. Date and time of collection are required.

2. Specimen source is required.

Specimen Required

Specimen Type: Body fluid

Preferred Source:

-Peritoneal fluid (peritoneal, abdominal, ascites, paracentesis)

-Pleural fluid (pleural, chest, thoracentesis)

-Drain fluid (drainage, JP drain)

-Pericardial

Acceptable Source: Write in source name with source location (if appropriate)

Collection Container/Tube: Sterile container

Submission Container/Tube: Plastic vial

Specimen Volume: 1 mL

Collection Instructions:

1. Centrifuge to remove any cellular material and transfer into a plastic vial.
2. Indicate the specimen source and source location on label.

Specimen Minimum Volume

0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject
Gross icterus	Reject
Anticoagulant or additive Breast milk Nasal secretions Gastric secretions Bronchoalveolar lavage (BAL) or bronchial washings Colostomy/ostomy Feces Cerebrospinal fluid Saliva Sputum Urine Vitreous fluid	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Body Fluid	Refrigerated (preferred)	7 days	
	Ambient	24 hours	
	Frozen	30 days	

Clinical & Interpretive

Clinical Information

Pleural fluid:

Pleural fluid is normally present within the pleural cavity surrounding the lungs, serving as a lubricant between the lungs and inner chest wall. Pleural effusion develops when the pleural cavity experiences an overproduction of fluid due to increased capillary hydrostatic and osmotic pressure that exceeds the ability of the lymphatic or venous system to return

the fluid to circulation. Laboratory-based criteria are often used to classify pleural effusions as either exudative or transudative. Exudative effusions form due to infection or inflammation of the capillary membranes allowing excess fluid into the pleural cavity. Patients with these conditions benefit from further investigation and treatment of the local cause of inflammation. Transudative effusions form due to systemic conditions such as volume overload, end stage kidney disease, and heart failure that can lead to excess fluid accumulation in the pleural cavity. Patients with transudative effusions benefit from treatment of the underlying condition.(1)

Dr. Richard Light derived criteria in the 1970s that are still used today for patients with pleural effusions.(2) The criteria include the measurement of total protein and lactate dehydrogenase (LDH) in pleural fluid and serum. Exudates are defined as meeting 1 of the following criteria:
1. Pleural fluid to serum protein ratio above 0.5
2. Pleural fluid LDH above two-thirds the upper limit of normal serum LDH
3. Pleural fluid to serum LDH ratio above 0.6

Dr. Light's criteria were designed to be sensitive for detecting exudates at the expense of specificity.(3) Heart failure and recent diuretic use contribute to most misclassifications by Dr. Light's criteria (transudates falsely categorized as exudates). Serum-to-fluid protein gradient (serum protein minus fluid protein) may be calculated in these cases and when more than 3.1 g/dL suggests the patient has a transudative effusion.

Peritoneal fluid:
The pathologic accumulation of fluid within the peritoneal cavity is commonly referred to as ascites. The most common cause of ascites is liver cirrhosis. Differentiating cardiac from cirrhotic ascites is a common clinical conundrum as they are common conditions presenting with elevated serum ascites albumin gradient.(4) Heart failure leads to the development of high gradient ascites due to hepatic sinusoidal hypertension. Since the sinusoids are normal and have not been damaged from collagen deposition associated with cirrhosis, protein tends to "leak" more readily into ascites and is associated with higher total protein concentrations.

Reference Values

An interpretive report will be provided.

Interpretation

A pleural fluid total protein to serum total protein ratio of above 0.5 is most consistent with exudative effusion.(2,5)

A peritoneal fluid total protein of above 2.5 g/dL in patients with a high serum ascites albumin gradient can be caused by heart failure. A peritoneal fluid total protein of over 1.0 g/dL helps to differentiate secondary from spontaneous bacterial peritonitis in conjunction with other laboratory, imaging, and clinical findings.(6,7,8)

The usefulness of measuring total protein in pericardial fluid is not well documented. Results may be interpreted in conjunction with serum or plasma total protein concentrations.

The usefulness of measuring total protein in synovial fluid is limited as it has poor sensitivity and specificity for differentiating inflammatory vs noninflammatory causes and should be interpreted in conjunction with other clinical findings.(9)

All other fluids: Total protein may be used to differentiate transudative from exudative effusions. The decision limits are not well defined in fluids other than pleural fluid and should be interpreted in conjunction with other clinical

findings.(10)

Cautions

In very rare cases, gammopathy, particularly type IgM (Waldenstrom macroglobulinemia), may cause unreliable results.

Clinical Reference

1. Block DR, Florkowski CM: Body fluids. In: Rifai N, Horvath AR, Wittwer CT. eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. Elsevier; 2018:chap 43
2. Light RW. The Light criteria: the beginning and why they are useful 40 years later. Clin Chest Med. 2013;34(1):21-26
3. Porcel JM. Identifying transudates misclassified by Light's criteria. Curr Opin Pulm Med. 2013;19(4):362-367
4. Block DR, Genzen JR: Diagnostic body fluid testing. In: Clarke W, ed. Contemporary Practice in Clinical Chemistry. 3rd ed. AACC Press; 2016:773-775
5. Sahn SA. Getting the most from pleural fluid analysis. Respirology. 2012;17(2):270-277
6. Runyon BA; AASLD. Introduction to the revised American Association for the Study of Liver Diseases Practice Guideline management of adult patients with ascites due to cirrhosis 2012. Hepatology. 2013;57(4):1651-1653. doi:10.1002/hep.26359
7. McGibbon A, Chen GI, Peltekian KM, van Zanten SV. An evidence-based manual for abdominal paracentesis. Dig Dis Sci. 2007;52(12):3307-3315
8. Runyon BA, Montano AA, Akriviadis EA, Antillon MR, Irving MA, McHutchison JG. The serum-ascites gradient is superior to the exudate-transudate concept in the differential diagnosis of ascites. Ann Intern Med. 1992;117(3):215-220
9. Shmerling RH, Delbanco TL, Tosteson AN, Trentham DE. Synovial fluid tests: what should be ordered? JAMA. 1990;264(8):1009-1014
10. Brunzel NA: Pleural, pericardial, and peritoneal fluid analysis. In: Fundamentals of Urine and Body Fluid Analysis. WB Saunders Company; 1994:406

Performance

Method Description

Divalent copper reacts in alkaline solution with protein peptide bonds to form the characteristic purple-colored biuret complex. Sodium potassium tartrate prevents the precipitation of copper hydroxide and potassium iodide prevents autoreduction of copper. The color intensity is directly proportional to the protein concentration which can be determined photometrically.(Package insert: TP2, Total Protein Gen.2. Roche Diagnostics; v9.0, 06/2017)

PDF Report

No

Day(s) Performed

Monday through Saturday

Report Available

Same day/1 to 2 days

Specimen Retention Time

1 week

Performing Laboratory Location

Mayo Clinic Jacksonville Clinical Lab

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 modified from the manufacturer's instructions. Its performance characteristics were 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

84157

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
TPBF	Protein, Total, BF	2881-1

Result ID	Test Result Name	Result LOINC® Value
TPBF1	Protein, Total, BF	2881-1
FLD23	Fluid Type, Protein, Total	14725-6