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MAYO CLINIC LABORATORIES

Test Definition: PLHBB

Plasma Free Hemoglobin, Plasma

Overview

Useful For

Determining whether hemolysis is occurring such as from:
-Transfusion reaction
-Mechanical fragmentation of red blood cells
-Relative comparison to baseline levels in extracorporeal membrane oxygenation and centrifugal ventricular assist device patients to assess pump disruption

Method Name

Spectrophotometry (SP)

NY State Available

Yes

Specimen

Specimen Type

Plasma EDTA

Specimen Required

Supplies: Sarstedt Aliquot Tube, 5 mL (T914)
Collection Container/Tube: Lavender top (EDTA)
Submission Container/Tube: Plastic vial
Specimen Volume: 2 mL Plasma
Collection Instructions:
1. Within 2 hours of collection, centrifuge and aliquot plasma into a plastic vial.
2. Results could be falsely elevated due to artifactual red blood cell lysis if not centrifuged within 2 hours of collection.

Forms

If not ordering electronically, complete, print, and send a Benign Hematology Test Request Form (T755) with the specimen.

Specimen Minimum Volume

Plasma: 1.5 mL

Reject Due To

Gross hemolysis	OK
Gross lipemia	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma EDTA	Refrigerated (preferred)	20 days	
	Ambient	4 days	
	Frozen	30 days	

Clinical & Interpretive

Clinical Information

Hemoglobin is contained within erythrocytes and significant amounts of "free hemoglobin" (outside the red blood cell [RBC]) are not normally present in plasma. This free hemoglobin is also called plasma hemoglobin.

Normal blood draw procedures cause a limited degree of unavoidable disruption and therefore a small amount of free hemoglobin may normally be present. When detectable, the total plasma hemoglobin and a subcomponent, oxyhemoglobin, are both reported.

Significant amounts of free hemoglobin occur in plasma following disruption of the RBC for any reason. This might result from a transfusion reaction or mechanical fragmentation of RBCs due to instrumentation, surgical procedures, or mechanical devices. Patients requiring support from extracorporeal membrane oxygenation or centrifugal ventricular assist devices are commonly monitored for trends in plasma free hemoglobin levels to assess for increasing hemolysis. Sharp spikes in plasma hemoglobin levels can indicate pump disruption. However, plasma hemoglobin can be artifactually increased due to a traumatic blood draw or prolonged exposure to post-draw RBCs. Additionally, bilirubin interferes substantially with the ability to calculate total plasma hemoglobin levels and results may be spurious and unreliable. This is a difficulty frequently encountered in serially tested patients. When this occurs, the oxyhemoglobin level tends to show less interference and will be the only analyte reported in the presence of increased bilirubin (>5 mg/dL). When using trending data, total plasma hemoglobin and oxyhemoglobin levels are not interchangeable and should be compared within their subgroups only.

Reference Values

Total plasma hemoglobin
> or =12 months: 0.0-15.2 mg/dL
Reference values have not been established for patients younger than 12 months.

Oxyhemoglobin
> or =12 months: 0.0-12.4 mg/dL
Reference values have not been established for patients younger than 12 months.

Interpretation

An elevation in plasma hemoglobin above the reference range indicates likely intravascular hemolysis due to one of the causes listed in the Useful For section.

Cautions

Test should not be performed on serum; hemoglobin is liberated from red blood cells during clotting and will falsely increase the result.

Drawing blood specimens for plasma hemoglobin measurement should be done with considerable care to avoid causing hemolysis.

Falsely elevated results due to artifactual red blood cell lysis could be seen if the specimen is not centrifuged within 2 hours of collection.

Causes of artifactually increased plasma hemoglobin should be excluded and include: forceful aspiration in sample procurement, cannula malposition (high negative-inflow pressures, inadequate pump speed to blood flow ratio), continuous renal replacement therapy, thrombosis or large hematomas.(1)

Bilirubin is a known interference with this assay. Elevated bilirubin levels significantly interfere with the quantitation of the total plasma hemoglobin. In the presence of elevated bilirubin (>5 mg/dL), only oxyhemoglobin will be reported. Trending data should be compared within analytes (ie, total plasma hemoglobin to total plasma hemoglobin; and oxyhemoglobin to oxyhemoglobin) as these represent different components in the blood. Therefore, in the presence of bilirubin, the trend can only be compared with baseline oxyhemoglobin levels.

If bilirubin is above 5 mg/dL, this comment will be added to the report:
Total plasma hemoglobin not reported due to elevated bilirubin interference. Oxyhemoglobin levels are not affected as significantly by bilirubin levels and are more reliable in this setting. If the plasma hemoglobin test is being utilized in a serial fashion, results should be compared within analyte type (eg, oxyhemoglobin to oxyhemoglobin levels for different time points) and using general trends. Because some variability in this test exists, multiple time points should be used to monitor trends and to confirm wide swings in levels. Because pigmented substances may cause nonspecific interference, clinical correlation is required to establish significance of individual test results.

Clinical Reference

1. Lubnow M, Philipp A, Foltan M, et al. Technical complications during veno-venous extracorporeal membrane oxygenation and their relevance predicting a system-exchange-retrospective analysis of 265 cases. PLoS One. 2014;9(12):e112316
2. Hayes D Jr, McConnell PI, Preston TJ, Nicol KK. Hyperbilirubinemia complicating plasma-free hemoglobin and antifactor Xa level monitoring on venovenous extracorporeal membrane oxygenation. World J Pediatr Congenit Heart Surg. 2014;5(2):345-347
3. Calvaresi EC, La'ulu SL, Snow TM, Allison TR, Genzen JR. Plasma hemoglobin: A method comparison of six assays for hemoglobin and hemolysis index measurement. Int J Lab Hematol. 2021;43(5):1145-1153. doi:10.1111/ijlh.13457

Performance

Method Description

Plasma is examined spectrophotometrically at 8 wavelengths ranging from 415 to 700 nm, and calculations are made that permit quantitation of total heme pigments, oxyhemoglobin, total bilirubin, and methemalbumin, comprising all the frequently encountered plasma pigments. Linearity studies have enabled reporting of values to 2000 mg/dL.(Fairbanks VF, Ziesmer SC, O'Brien PC. Methods for measuring plasma hemoglobin in micromolar concentration compared. Clin Chem. 1992;38[1]:132-140; Neal JR, Quintana E, Pike RB, Hoyer JD, Joyce LD, Schears G. Using daily plasma-free

hemoglobin levels for diagnosis of critical pump thrombus in patients undergoing ECMO or VAD support. J Extra Corpor Technol. 2015;47[2]:103-108)

PDF Report
No

Day(s) Performed
Monday through Sunday

Report Available
1 to 3 days

Specimen Retention Time
7 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

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

CPT Code Information
83051

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
PLHBB	Plasma Free Hemoglobin, P	87433-9

Result ID	Test Result Name	Result LOINC® Value
31970	Total Plasma Hemoglobin	721-1
31971	Oxyhemoglobin	87437-0