Test Definition: HGBCE

Hb Variant, A2 and F Quantitation,B

Overview

Useful For

Monitoring patients with sickling disorders who have received hydroxyurea or transfusion therapy

This test is **not intended for** diagnostic purposes.

This test is **not useful for** screening purposes.

Testing Algorithm

See Benign Hematology Evaluation Comparison in Special Instructions.

Special Instructions

- Metabolic Hematology Patient Information
- Benign Hematology Evaluation Comparison

Method Name

Capillary Electrophoresis

NY State Available

Yes

Specimen

Specimen Type

Whole Blood EDTA

Ordering Guidance

This test is intended for monitoring purposes, such as the increase in hemoglobin F (Hb F) after therapy, or the levels of hemoglobin variants after transfusion.

If the patient has never been appropriately studied, hemoglobin electrophoresis is necessary (see HBEL1 / Hemoglobin Electrophoresis Evaluation, Blood).

Specimen Required

Container/Tube:

Preferred: Lavender top (EDTA)

Acceptable: Yellow top (ACD) or green top (heparin)

Specimen Volume: 4 mL

Collection Instructions:

1. Submit fresh specimen.

2. Send specimen in original tube. Do **not** transfer blood to other containers.

Forms

1. Metabolic Hematology Patient Information (T810) in Special Instructions

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

Reject Due To

Gross hemolysis	OK

Specimen Minimum Volume

1 mL

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Whole Blood EDTA	Refrigerated (preferred)	10 days	

Clinical & Interpretive

Clinical Information

The treatment of red blood cell sickling disorders may involve many therapeutic modalities. Two of the most important and beneficial are treatment with hydroxyurea and chronic transfusion therapy. Hydroxyurea causes elevation of fetal hemoglobin (Hb F) levels, and transfusion serves to lower the percentage of hemoglobin S (Hb S). Both of these therapeutic modalities act to lessen the number and severity of sickling crises. Thus, periodic monitoring of Hb F and Hb S levels are needed to guide further therapy.

Reference Values

HEMOGLOBIN A

1-30 days: 5.9-77.2%

1-2 months: 7.9-92.4%

3-5 months: 54.7-97.1%

6-8 months: 80.0-98.0%

9-12 months: 86.2-98.0%

13-17 months: 88.8-98.0%

18-23 months: 90.4-98.0%

> or =24 months: 95.8-98.0%

HEMOGLOBIN A2

1-30 days: 0.0-2.1%

1-2 months: 0.0-2.6%

3-5 months: 1.3-3.1%

> or =6 months: 2.0-3.3%

HEMOGLOBIN F

1-30 days: 22.8-92.0%

1-2 months: 7.6-89.8%

3-5 months: 1.6-42.2%

6-8 months: 0.0-16.7%

9-12 months: 0.0-10.5%

13-17 months: 0.0-7.9%

18-23 months: 0.0-6.3%

> or =24 months: 0.0-0.9%

VARIANT 1

0.0

VARIANT 2

0.0

VARIANT 3

0.0

Interpretation

Clinically, optimal levels of hemoglobin S (Hb S) and fetal hemoglobin (Hb F) are patient specific and depend on a number of factors including response to therapy. This test will be performed by capillary electrophoresis and any detected variant present will be reported as their zone only, including Hb S. No confirmatory functional study, such as sickle solubility, will be performed as this test is designed for quantitative monitoring of previously confirmed hemoglobin fractions.

Information reported: Percentages of hemoglobin A (Hb A), hemoglobin A2 (Hb A2), Hb F and any detected hemoglobin variant present. Variants will be reported as zones and are not specific, even if present in Z5 (Zone S). If the identity of the variant has not been previously confirmed, diagnostic hemoglobin electrophoresis testing is necessary (see HBEL1 / Hemoglobin Electrophoresis Evaluation, Blood).

Cautions

Peaks present in zones Z9, Z7, Z6, Z5, Z4, Z3, and Z2-recently labeled the Z(A), Z(F), Z(D), Z(S), Z(E), Z(A2), and Z(C) zones, respectively-may not represent the hemoglobin fractions the zones are named after as other variants can migrate to these zones, including the S, F, A, and A2 positions.

Although the most common variants are easily detected, many hemoglobin variants are not detected by the capillary electrophoresis method alone or can migrate with, and cannot be discriminated from, common variants. Therefore, this test should not be used for screening purposes due to low sensitivity.

Recent transfusion may mask protein results including hemoglobin electrophoresis, hereditary persistence of fetal hemoglobin (HPFH) by flow cytometry, stability studies, and sickle solubility studies depending on percentage of transfused cells present.

Some hemoglobin variants can originate from the donor blood product and not from the tested recipient. These are typically found in low percentage.

Some hemoglobin variants do not sufficiently resolve from other peaks, which precludes separate quantitation of percentages. These will be reported as a single percentage that represents more than 1 variant.

Some therapies cause artefactual effects in protein studies, including Voxelotor (artefactual peaks). These peaks may vary between samples or patients.

Clinical Reference

1. Riou J, Szuberski J, Godart C, et al: Precision of CAPILLARYS 2 for the detection of hemoglobin variants based on their migration positions. Am J Clin Pathol. 2018 Jan 29;149(2):172-180

2. National Heart, Lung, and Body Institute Expert Panel: Evidence-Based Management of Sickle Cell Disease: Expert Panel Report, 2014. NIH Publication No. 02-2117 US Department of Health and Human Services: National Institutes of Health; 2014:1-142

3. Rosse WF, Telen M, Ware R: Transfusion Support for Patients with Sickle Cell Disease. American Association of Blood Banks; 1998

4. Ferster A, Tahriri P, Vermylen C, et al: Five years of experience with hydroxyurea in children and young adults with sickle cell disease. Blood. 2001;97:3268-3632

5. Charache S, Terrin ML, Moore RD, et al: Effect of hydroxyurea on the frequency of painful crises in sickle cell anemia. Investigators of the Multicenter Study of Hydroxyurea in Sickle Cell Anemia. N Engl J Med. 1995 May;332(20):1317-1322

6. Keren DF, Shalhoub R, Gulbranson R, Hedstrom D: Expression of hemoglobin variant migration by capillary electrophoresis relative to hemoglobin A2 improves precision. Am J Clin Pathol. 2012 Apr;137(4):660-664

Performance

Method Description

The CAPILLARYS System is an automated system that uses capillary electrophoresis (CE) to separate charged molecules

by their electrophoretic mobility in an alkaline buffer. Separation occurs according to the electrolyte pH and electro-osmotic flow. A sample dilution with hemolyzing solution is injected by aspiration. A high voltage protein separation occurs and direct detection of the hemoglobin protein fractions is at 415 nm, which is specific to hemoglobins. The resulting electropherogram peaks are evaluated for pattern abnormalities and are quantified as a percentage of the total hemoglobin present. For diagnostic purposes, the overall schematic has been grouped into 15 unequal zones (Z) numbered from right to left with zones Z9, Z7, Z6, Z5, Z4, Z3 and Z2-relabeled as Z(A), Z(F), Z(D), Z(S), Z(E), Z(A2) and Z(C) zones, respectively. Hemoglobin A (Hb A) and Hb A2 are used as internal standards and are assigned the numerical positions 150 and 243, respectively.(Louahabi A, Philippe M, Lali S, Wallemacq P, Maisin D: Evaluation of a new Sebia kit for analysis of hemoglobin fractions and variants on the Capillarys system. Clin Chem Lab Med. 2006;44[3]:340-345; instruction manual: CAPILLARYS Hemoglobin[E]using the CAPILLARYS 2 flex-piercing instrument. Sebia; 06/2014)

PDF Report
No

Specimen Retention Time
7 days

Performing Laboratory Location
Rochester

Fees & Codes

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
83020

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
HGBCE	Hb Variant, A2 and F Quantitation,B	43113-0

Result ID	Reporting Name	LOINC®
41927	Hb A	20572-4
41928	Hb F	4576-5

41929	Hb A2	4551-8
41930	Variant 1	24469-9
41931	Variant 2	24469-9
41932	Variant 3	24469-9
41933	HGBCE Interpretation	78748-1