MAYO CLINIC LABORATORIES

Test Definition: AK1

Adenylate Kinase Enzyme Activity, Blood

Overview

Useful For

Evaluation of chronic nonspherocytic hemolytic anemia

Method Name

Kinetic Spectrophotometry (KS)

NY State Available

Yes

Specimen

Specimen Type

Whole Blood ACD-B

Specimen Required

Collection Container/Tube:

Preferred: Yellow top (ACD solution B)

Acceptable: Lavender top (EDTA) or yellow top (ACD solution A)

Specimen Volume: 6 mL

Collection Instructions:

1. Invert several times to mix blood.
2. Send whole blood specimen in original tube. **Do not aliquot.**

Forms

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

Specimen Minimum Volume

1 mL

Reject Due To

Gross hemolysis	Reject
Fully clotted	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Whole Blood ACD-B	Refrigerated	20 days	

Clinical & Interpretive

Clinical Information

Adenylate kinase (AK) is a monomeric enzyme that catalyzes nucleotide phosphoryl interconversion of adenosine triphosphate (ATP) and adenosine monophosphate (AMP) to 2 molecules of adenosine diphosphate (ADP). The level of enzyme activity in neonates is normally mildly to moderately lower than in adults. AK deficiency (OMIM 612631) is a rare cause of autosomal recessive nonspherocytic hemolytic anemia.

Although rare, AK deficient-associated anemia has been described in multiple families of varied ethnic origin. Those individuals with heterozygous genetic alterations are predominantly asymptomatic and show a normal phenotype. Those individuals with homozygous or compound heterozygous genetic alterations display congenital chronic nonspherocytic hemolytic anemia (hemoglobin [Hb] levels of 8-9 g/dL) with hyperbilirubinemia and gallstones. Patients typically present at birth or in early childhood. Some patients have psychomotor impairment, although the pathogenesis is not well understood. Concurrent glucose 6-phosphate dehydrogenase (G6PD) deficiency exacerbates the anemia (Hb 6 g/dL). AK activity levels range from 0% to 44%, although most show less than 30% activity. Carriers have normal to only mildly decreased enzyme activity.(1) Patients may respond well to splenectomy.

Reference Values

> or =12 months: 195-276 U/g Hb
Reference values have not been established for patients younger than 12 months.

Interpretation

In adenylate kinase deficiency, values are expected to be less than 30% of normal mean, although this value should be interpreted in the context of age of the patient and other enzyme values.

Cautions

Recent transfusion may mask the patient's intrinsic enzyme activity and cause unreliable results.

Some enzyme deficiency disorders can be masked by reticulocytosis and comparison of activities of other red blood cell enzyme activities in this panel can be useful.

Adenylate kinase enzyme activity can normally be mildly to moderately decreased in neonates.

Clinical Reference

1. Niizuma H, Kanno H, Sato A, Ogura H, Imaizumi M. Splenectomy resolves hemolytic anemia caused by adenylate kinase deficiency. Pediatr Int. 2017;59(2):228-230
2. Rapley S, Harris H. Red cell adenylate kinase activity in AK1 and AK 2-1 phenotypes. Annals of Human Genetics. 1970;33:361-364. doi:10.1111/j.1469-1809
3. Mohrenweiser HW. Frequency of enzyme deficiency variants in erythrocytes of newborn infants. Proc Natl Acad Sci U S A. 1981;78(8):5046-5050
4. Corrons JL, Garcia E, Tusell JJ, Varughese KI, West C, Beutler E. Red cell adenylate kinase deficiency: molecular study of 3 new mutations (118G>A, 190G>A, and GAC deletion) associated with hereditary nonspherocytic hemolytic anemia. Blood. 2003;102(1):353-356
5. Toren A., Brok-Simoni F, Ben-Bassat I, et al. Congenital haemolytic anaemia associated with adenylate kinase deficiency. Brit J Haemat. 1994;87(2):376-380

6. Bianchi P, Zappa M, Bredi E, et al. A case of complete adenylate kinase deficiency due to a nonsense mutation in AK-1 gene (arg107-to-stop, CGA-to-TGA) associated with chronic haemolytic anaemia. Brit J Haemat. 1999;105(1):75-79
7. Lachant NA, Zerez CR, Barredo J, et al. Hereditary erythrocyte adenylate kinase deficiency: A defect of multiple phosphotransferases? Blood. 1991;77(12):2774-2784
8. Koralkova P, van Solinge WW, van Wijk R. Rare hereditary red blood cell enzymopathies associated with hemolytic anemia-pathophysiology, clinical aspects and laboratory diagnosis. Int J Lab Hematol. 2014;36(3):388-397

Performance

Method Description
Adenylate kinase (myokinase) catalyzes the dismutation of adenosine diphosphate (ADP) into adenosine monophosphate and adenosine triphosphate. In this assay, the reverse reaction is measured by following the formation of ADP with pyruvate kinase and lactate dehydrogenase reactions resulting in 1,4-dihydronicotinamide adenine dinucleotide (NADH) being oxidized to nicotinamide adenine dinucleotide (NAD+). The decrease in absorbance that occurs as NADH is oxidized is measured spectrophotometrically at 340 nm by an automated chemistry analyzer.(Beutler E. Red Cell Metabolism. A Manual of Biochemical Methods. 3rd ed. Grune and Stratton; 1984:93-95; Rab MAE, van Wijk R. Enzymes of the red blood cell. In: Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, eds. Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:chap 78)

PDF Report
No

Day(s) Performed
Tuesday, Thursday

Report Available
1 to 6 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

Test Definition: AK1

Adenylate Kinase Enzyme Activity, Blood

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

82657

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
AK1	Adenylate Kinase, B	44051-1

Result ID	Test Result Name	Result LOINC® Value
AKCL	Adenylate Kinase, B	44051-1