MAYO CLINIC LABORATORIES

Test Definition: ALKP

Alkaline Phosphatase, Total and Isoenzymes, Serum

Overview

Useful For

Aid in the diagnosis and treatment of liver, bone, intestinal, and parathyroid diseases

Determining the tissue source of increased alkaline phosphatase (ALP) activity in serum

Differentiating between liver and bone sources of elevated ALP

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
ALP	Alkaline Phosphatase, S	Yes	Yes
ALPI	Alkaline Phosphatase Isoenzymes, S	No	Yes

Method Name

ALP: Colorimetric
ALPI: Electrophoresis

NY State Available

Yes

Specimen

Specimen Type

Serum

Necessary Information

Patient's age and sex are required.

Specimen Required

Patient Preparation:
Fasting: 8 hours, required
Supplies: Sarstedt Aliquot Tube, 5 mL (T914)
Collection Container/Tube:
Preferred: Serum gel
Acceptable: Red top
Submission Container/Tube: Plastic vial
Specimen Volume: 1 mL

Collection Instructions:
1. Within 2 hours of collection, centrifuge the specimen.
2. For red top tubes, immediately aliquot into a plastic vial.
3. For serum gel tubes, serum may sit on gel refrigerated but must be aliquoted within 7 days.

Forms
If not ordering electronically, complete, print, and send 1 of the following forms with the specimen:
-Kidney Transplant Test Request
-General Request (T239)

Specimen Minimum Volume
1 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK
Gross icterus	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Frozen (preferred)	14 days	
	Ambient	7 days	
	Refrigerated	7 days	

Clinical & Interpretive

Clinical Information
Serum alkaline phosphatase (ALP) is used in the diagnosis of hepatobiliary disease and bone disease associated with increased osteoblastic activity. ALP is present in a number of tissues including liver, bone, intestine, and placenta. The activity of ALP found in serum is a composite of isoenzymes from those sites.

A rise in liver ALP activity occurs with all forms of cholestasis, particularly with obstructive jaundice.

Bone ALP is elevated in disorders of the skeletal system that involve osteoblast hyperactivity and bone remodeling, such as Paget disease, rickets, osteomalacia, fractures, and malignant tumors.

Moderate elevation of ALP may be seen in other disorders such as Hodgkin disease, congestive heart failure, ulcerative colitis, regional enteritis, and intra-abdominal bacterial infections.

Reference Values

ALKALINE PHOSPHATASE
Males
0-14 days: 83-248 U/L
15 days-<1 year: 122-469 U/L
1-<10 years: 142-335 U/L
10-<13 years: 129-417 U/L
13-<15 years: 116-468 U/L
15-<17 years: 82-331 U/L
17-<19 years: 55-149 U/L
> or =19 years: 40-129 U/L
Females
0-14 days: 83-248 U/L
15 days-<1 year: 122-469 U/L
1-<10 years: 142-335 U/L
10-<13 years: 129-417 U/L
13-<15 years: 57-254 U/L
15-<17 years: 50-117 U/L
> or =17 years: 35-104 U/L

ALKALINE PHOSPHATASE ISOENZYMES
Ages:
< or =17 years: Reference values have not been established for patients younger than 18 years.
> or =18 years:
Liver %: 30.2-74.7
Liver U/L: 15.8-71.9
Bone %: 23.8-68.3
Bone U/L: 12.0-56.7
Intestine %: < or =22.5
Intestine U/L: < or =12.6

Interpretation

Liver alkaline phosphatase (ALP) isoenzyme is most frequently elevated when total ALP is elevated. Increased liver ALP is associated with a wide group of conditions including acute hepatitis, cirrhosis, fatty liver, drug induced liver disease, obstruction of biliary flow, bile duct stricture, primary biliary cirrhosis, and metastatic carcinoma of the liver.

Bone ALP is elevated due to increased osteoblastic activity. Abnormally elevated bone ALP may be indicative of bone tumors, Paget's disease, or renal rickets.

Intestinal ALP is detectable in approximately 20% of samples tested. Intestinal ALP is most frequently noted postprandially in patients with blood group O or B.

Transient hyperphosphatasemia is a temporary condition in children under 5 years, in which serum ALP activity is elevated 3-20 times the upper reference range with no clinical indications for the elevation.

Transient hyperphosphatasemia of infancy and early childhood is characterized by a marked elevation of serum alkaline phosphatase in the absence of detectable liver or bone disease, with a return to normal levels within weeks or months.

Cautions

Alkaline phosphatase (ALP) Isoenzyme:
-High concentrations of phosphate, oxalate, citrate, and cyanide will inhibit ALP activity.
-Excess glycine may inhibit ALP activity by complexing magnesium.
-Patients should be fasting. Patients may have an elevated intestinal ALP about two hours after a fatty meal.

Clinical Reference

1. Rifai N, Horvath AR, Wittwer CT, eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics 6th ed. Elsevier; 2018
2. Lowe D, Sanvictores T, John S. Alkaline phosphatase. In: StatPearls [Internet]. StatPearls Publishing; 2021. Updated October 29, 2023. Accessed April 22, 2025. Available at www.ncbi.nlm.nih.gov/books/NBK459201
3. Teitelbaum JE, Laskowski A, Barrows FP. Benign transient hyperphosphatasemia in infants and children: a prospective cohort. J Pediatr Endocrinol Metab. 2011;24(5-6):351-353
4. Jassam NJ, Horner J, Marzo-Ortega H, Sinclair M, Barth JH. Transient rise in alkaline phosphatase activity in adults. BMJ Case Rep. 2009;2009:bcr09.2009.2250
5. Verma J, Gorard DA. Persistently elevated alkaline phosphatase. BMJ Case Rep. 2012;2012:bcr2012006768
6. Sharma U, Pal D, Prasad R. Alkaline phosphatase: an overview. Indian J Clin Biochem. 2014;29(3):269-278

Performance

Method Description

Total Alkaline Phosphatase:
In the presence of magnesium and zinc ions, p-nitrophenyl phosphate is cleaved by phosphatases into phosphate and p-nitrophenol. The p-nitrophenol released is directly proportional to the catalytic alkaline phosphatase (ALP) activity. It is determined by measuring the increase in absorbance.(Package insert: Alkaline Phosphatase reagent. Roche Diagnostics; V 9.0 10/2021)

Alkaline phosphatase Isoenzymes:
Alkaline phosphatase isoenzymes are separated by agarose gel electrophoresis and visualized using BCIP (5-Bromo-4-chloro-3-indolyl phosphate p-toluidine salt) substrate.(Package insert: SPIFE Touch Alkaline Phosphatase [ALP] Isoenzyme. Helena Laboratories; 01/2024)

PDF Report

No

Day(s) Performed

Tuesday through Saturday

Report Available

3 to 5 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 has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information
84075
84080

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
ALKP	Alkaline Phosphatase, Tot and Iso,S	24332-9

Result ID	Test Result Name	Result LOINC® Value
ALP	Alkaline Phosphatase, S	6768-6
622367	Alkaline Phosphatase Isoenzymes, S	12805-8
622369	Liver Percent	15015-1
622368	Liver	1779-8
622371	Bone Percent	15013-6
622370	Bone	1777-2
622373	Intestine Percent	15014-4
622372	Intestine	1778-0