Alkaline Phosphatase Enzyme (ALP) Enzymes

Alkaline phosphatase enzyme is a group of enzymes that catalyze the hydrolysis reaction of phosphate esters at an alkaline or basic pH.

There are at least five isoenzymes derived from the liver, bone, intestine, placenta, and tumor-associated tissues separated by electrophoresis. Placenta and tumor-associated alkaline phosphatase are the most heat resistant to inactivation. The bone and liver account for approximately 95% of these enzymes.

Their half-life is 7– 10 days.

An ALP test only requires a blood sample.

Normal range:

- 0–1 year: 150–350 IU/L
- 1–16 years: 30–300 IU/L
- >16 years: 30–115 IU/L

Children have higher levels of ALP than adults because their bones are still growing.

Pregnant mothers have higher ALP levels than usual during the second and third trimesters of pregnancy.

Uses of alkaline phosphatase enzyme

Diagnosis and treatment of the liver, bone, intestinal, and parathyroid diseases

Diagnosis of causes and monitoring course of cholestasis.

What do the results of this test indicate?

Interpretation of the results

Alkaline phosphatase enzyme is increased In

- Increased bone formation
- Bone diseases such as metastatic carcinoma of the bone, myeloma, Paget disease)
- Renal disease ie renal rickets associated with secondary hyperparathyroidism)
- Liver disease
- Miscellaneous conditions such as ulcerative colitis, pancreatitis, phenytoin, and alcohol use).
- Hyperparathyroidism
- Paget disease (osteitis deformans)

Marked elevation in the absence of liver disease is most suggestive of Paget disease of bone or metastatic carcinoma from the prostate.
An increase in cases of metastases to the bone is marked only in prostate carcinoma.

- Osteoblastic bone tumors (osteogenic sarcoma, metastatic carcinoma).
- Osteogenesis imperfecta.
- Familial osteoectasia.
- Osteomalacia, rickets.
- Polyostotic fibrous dysplasia.
- Late pregnancy.
- Transient hyperphosphatasemia of infancy
- Hodgkin disease.
- Healing of extensive fractures (slightly).
- Liver disease

Any obstruction of the biliary system like in gallstones, carcinoma, primary biliary cirrhosis) is a sensitive indicator of intrahepatic or extrahepatic cholestasis.

Whenever the alkaline phosphatase is elevated, a simultaneous elevation of 5?-nucleotidase (5?-N) establishes biliary disease as the cause of the elevated ALP. If the 5?-N is not increased, the cause of the elevated ALP must be found elsewhere (e.g., bone disease).

Other conditions where the enzyme is elevated are;

- Liver infiltrates (e.g., amyloid or leukemia)
- Cholangiolar obstruction in hepatitis (e.g., infectious, toxic)
- Hepatic congestion due to heart disease
- Adverse reaction to a therapeutic drug (e.g., chlorpropamide)
- Increased synthesis of ALP in the liver
- Diabetes mellitus.
- ALP may be increased during complications of pregnancy (e.g., preeclampsia, eclampsia, threatened abortion)
- Benign familial hyperphosphatasemia.
- Ectopic production by neoplasm (Regan isoenzyme) without the involvement of the liver or bone (e.g., Hodgkin disease.
- Vascular endothelium origin—some patients with myocardial, pulmonary, renal, or splenic infarction, usually after 7 days during the phase of the organization.
- Hypophosphatasia (liver and bone isoenzymes).
- Hyperthyroidism (liver and bone isoenzymes).

  Increased ALP alone in a chemical profile, especially with a decreased serum cholesterol and lymphocytosis, should suggest excess thyroid medication or hyperthyroidism.

- Primary hypophosphatemia (often increased).
- Children—mostly bone; little or no liver or intestine.
- Adults—liver with little or no bone or intestine; after age 50, increasing amounts of bone.

These enzymes are decreased in;

- Hypothyroidism
- Gross anemia
- Hypophosphatemia
- Vitamin B12 deficiency
- Excess vitamin D ingestion
- Milk-alkali (Burnett) syndrome Congenital hypophosphatasia
- Achondroplasia
- Hypothyroidism, cretinism
- Pernicious anemia
- Celiac disease
- Postmenopausal women with osteoporosis taking estrogen replacement therapy
- Therapeutic agents (e.g., corticosteroids, trifluoperazine, antilipemic agents)
- Cardiac surgery with cardiopulmonary bypass pump.