Amylase and Lipase Tests

Also known as: Amy 
Formal name: Amylase 
Related tests: Lipase

The Test

The blood amylase test is ordered, often along with a lipase test, to help diagnose and monitor acute or chronic pancreatitis (inflammation of the pancreas) and other disorders that may involve the pancreas. A urine amylase test may also be ordered. Typically, its level will mirror blood amylase concentrations, but both the rise and fall occur later. Sometimes a urine creatinine clearance may be ordered along with the urine amylase to help evaluate kidney function since decreased kidney function can result in a slower rate of amylase clearance.

Amylase tests are sometimes used to monitor treatment of some cancers involving the pancreas and after removal of gallstones that have caused gallbladder attacks.

A blood amylase test may be ordered when a patient has symptoms of a pancreatic disorder, such as severe abdominal pain, fever, loss of appetite, or nausea. A urine amylase test may be ordered along with or following a blood amylase test. One or both may also be ordered when a doctor wants to monitor a patient to evaluate the effectiveness of treatment and to determine whether amylase levels are increasing or decreasing over time.

Test result mean

In acute pancreatitis, amylase in the blood increases (often to 4-6 times higher than the highest reference value, sometimes called upper limit of normal). The increase occurs within 12 hours of injury to the pancreas and generally remains elevated until the cause is successfully treated.
Then the amylase values will return to normal in a few days. In chronic pancreatitis, amylase levels initially will be moderately elevated but often decrease over time with progressive pancreas damage.

Amylase levels may also be significantly increased in patients with pancreatic duct obstruction, cancer of the pancreas, and gallbladder attacks. Urine and blood amylase levels may also be elevated with a variety of other conditions, such as ovarian cancer, lung cancer, tubal pregnancy, mumps, intestinal obstruction, or perforated ulcer, but amylase tests are not generally used to diagnose or monitor these disorders.

Decreased blood and urine amylase levels may indicate permanent damage to the amylase-producing cells in the pancreas. Increased blood amylase levels with normal to low urine amylase levels may indicate decreased kidney function or the presence of a macroamylase, a benign complex of amylase and other proteins that accumulates in the blood.

Since reference values for amylase vary from laboratory to laboratory, depending on the test method used, there is no universally accepted number that can be called normal or high.

In acute pancreatitis, elevated amylase levels usually parallel lipase concentrations, although lipase levels may take a bit longer to rise than blood amylase levels and will remain elevated longer.

Chronic pancreatitis is often associated with alcoholism. It may also be caused by trauma, pancreatic duct obstruction, and seen in association with genetic abnormalities such as cystic fibrosis. Amylase levels may be moderately elevated with chronic pancreatitis but often decrease over time with progressive pancreas damage.

Some drugs that may cause amylase to rise include aspirin, diuretics, oral contraceptives, corticosteroids, indomethacin, ethyl alcohol, and opiates. Amylase is an enzyme that has several different forms called isoenzymes.
Different tissues make different forms. P-amylase refers to the type of amylase made mainly in the pancreas. S-amylase refers to the type of amylase made mainly by the salivary glands. P-amylase in blood increases when the pancreas is inflamed or damaged. S-amylase in blood increases when the salivary gland is inflamed or damaged.

This test measures the amount of amylase in the blood or urine. Amylase is one of several enzymes produced by the pancreas to help digest fats, proteins, and carbohydrates. It is secreted through the pancreatic duct into the duodenum, where it helps break down dietary carbohydrates. Amylase is also produced by other organs, particularly the salivary glands.

Amylase is usually present in the blood and urine in small quantities. When cells in the pancreas are injured (as in pancreatitis) or the pancreatic duct is blocked (by a gallstone or rarely by a pancreatic tumor), increased amounts of amylase find their way into the bloodstream, increasing concentrations in the blood and the urine, which is the excretion path for amylase from the blood.

A blood sample is taken by needle from a vein in the arm. Sometimes a 24-hour urine sample is collected.

Test for lipase

The blood test for lipase is ordered, often along with an amylase test, to help diagnose and monitor acute pancreatitis (inflammation of the pancreas), chronic pancreatitis, and other disorders that involve the pancreas.

Lipase testing is also occasionally used in the diagnosis and follow-up of cystic fibrosis, celiac disease, and Crohn's disease.

A lipase test may be ordered when a patient has symptoms of a pancreatic disorder, such as severe abdominal pain, fever, loss of appetite, or nausea. It may also be ordered at intervals when a doctor wants to monitor a patient with a pancreas condition to evaluate the effectiveness of treatment.
and to determine whether the lipase levels are increasing or decreasing over
time.
In acute pancreatitis, lipase levels are frequently very high, often 5 to 10
times higher than the highest reference value (often called the upper
limit of normal). In acute pancreatitis, lipase concentrations rise within
24 to 48 hours of an acute pancreatic attack and may remain elevated for
about 5 to 7 days. Concentrations may also be increased with pancreatic
duct obstruction, pancreatic cancer, and other pancreatic diseases.

Moderately increased lipase values may occur in other conditions such
as kidney disease (due to decreased clearance from the blood), salivary
gland inflammation, a bowel obstruction, or peptic ulcer disease,
although the lipase test is not usually used to monitor these conditions.
Decreased lipase levels may indicate permanent damage to the lipase-
producing cells in the pancreas.

Since the reference values for lipase will vary from laboratory to
laboratory, depending on the test method used, there is no universally
accepted number that can be called normal or high.

In acute pancreatitis, elevated lipase levels usually parallel blood amylase
concentrations, although amylase levels tend to rise and fall a bit sooner
than lipase levels. Drugs that may increase lipase levels include codeine,
indomethacin, and morphine.

With acute pancreatitis there is usually no long term damage, and often
no further problems develop. Chronic pancreatitis, which may present
as a series of acute attacks or as an ongoing upset can cause permanent
damage.

As the pancreas becomes more scarred, some people develop diabetes
and/or the inability to digest foods, especially fats. The lack of normal
pancreatic enzymes may lead to adverse effects on food digestion and
waste production, causing abdominal pain, greasy stools, and formation
of stones in the pancreas. Even if the disease is controlled, the damage
done is often irreversible. If the disease progresses, it could lead to death.

In some cases, an elevated lipase may be due to a condition other than pancreatitis. In pancreatitis, the lipase rises quickly and drops in 5 to 7 days. In other conditions, the rise is usually not as great, and the level may be maintained for a longer period.

Blood amylase levels are sensitive for pancreatic disorders but are not specific. An elevated amylase may indicate a problem but non-pancreatic disorders can cause increased amylase levels. Lipase levels are usually increased in pancreatic disorders and are more specific than amylase for diseases of the pancreas. Evaluating the results of the two tests together help to diagnose or rule out pancreatitis and other conditions.

Serum amylase and lipase are common tests obtained as biochemical markers for acute pancreatitis. However, the interpretation of these tests can be difficult since several non-pancreatic conditions can present with abnormal serum amylase and lipase levels. In addition, some patients with pancreatitis have normal serum amylase and lipase levels when a blood sample is examined.

Several factors can influence serum amylase and lipase levels.

- The levels depend upon the rate of production from different tissues and the rate of clearance. As an example, serum amylase and lipase levels may be elevated in patients with renal failure.

- Organs other than the pancreas can produce these enzymes. Alcoholics, for example, may have an elevated serum amylase of salivary origin. The most commonly used amylase assays cannot differentiate between salivary and pancreatic amylase.

- Certain serum factors influence amylase and lipase enzyme activity. As an example, patients with pancreatitis due to hypertriglyceridemia may appear to have normal amylase levels, most likely due to a circulating factor that inhibits the enzyme's activity.
Diabetic ketoacidosis

Increased amylase and lipase occurs 16–25% of the time in diabetic ketoacidosis (DKA). Acute pancreatitis can present or coexist with DKA and aggravate its severity. Nonspecific elevations of amylase in DKA have been reported, although increased serum lipase is assumed to indicate actual pancreatic involvement. There are cases of DKA described in which elevated enzymes were seen without clinical or radiographic evidence of acute pancreatitis.

The clinical diagnosis of acute pancreatitis rests on the presence of abdominal pain and associated increases of amylase and lipase, while CT scan is recognized as the gold standard for confirmation. The prevailing opinion is that absolute enzyme elevations greater than three times normal indicate pancreatic involvement. Although this may be true in many situations, the above cases and recent studies support the notion that such elevations without actual pancreatic involvement may be nondiagnostic in the presence of DKA, as evidenced by absence of abdominal findings and CT scan abnormalities. However, it should not be overlooked that acute pancreatitis can sometimes accompany or precipitate DKA.

The source of elevated enzymes in DKA without acute pancreatitis remains unclear. Subtle injury to the pancreatic acinar cells may liberate them into the circulation.

Another possibility is an extra-pancreatic origin triggered by the dys-metabolic state, like release of salivary gland amylase, or its accumulation secondary to suboptimal excretion in the urine. Increase in lipase may be due to release of non-pancreatic lipolytic enzymes into the bloodstream from sources such as the stomach, liver, small bowel, tongue, esophagus, etc. Some authors have suggested that hyperlipasemia may be related to assay inaccuracy in such cases.

In conclusion, significant but nonspecific elevations of amylase can be seen in DKA. Elevated lipase, traditionally thought to be more specific for pancreatitis, may also accompany DKA and does not necessarily
denote concomitant pancreatic inflammation. Hyperlipasemia may therefore be less reliable for diagnosing acute pancreatitis in this setting.

Regarding selection on these tests, two practice guidelines state:

“It is usually not necessary to measure both serum amylase and lipase. Serum lipase may be preferable because it remains normal in some non-pancreatic conditions that increase serum amylase including macroamylasemia, parotitis, and some carcinomas. In general, serum lipase is thought to be more sensitive and specific than serum amylase in the diagnosis of acute pancreatitis”

“Although amylase is widely available and provides acceptable accuracy of diagnosis, where lipase is available it is preferred for the diagnosis of acute pancreatitis (recommendation grade A)”