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ST VINCENT'S PATHOLOGY

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AMYLASE INFORMATION SHEET

GENERAL

STRUCTURE AND FUNCTION: Amylase is an enzyme produced by the exocrine glands with ability to cleave 1,4-glucose linkages. Amylase breaks down starch into maltose and limit dextrans. Alpha-amylase is found in animals, beta-amylase in plants. The enzyme requires calcium and chloride ions for activity. There are at least 2 amylase isoenzymes, S (salivary, 1) and P (pancreatic, 2). It is a lyase (1,4-glucanglucanohydrolase). The molecular weight is 45,000 and the Enzyme Commission number is EC 3.2.1.1.

PHYSIOLOGY: Amylase is produced in the pancreas and salivary glands and to a lesser extent the fallopian tubes. Very little is present in other organs. From the pancreas amylase is secreted via the pancreatic and then common bile ducts into the duodenum where it plays an important role in the digestion of complex carbohydrates. In normal plasma about 40% of circulating amylase is of pancreatic origin with the rest coming from the salivary glands.

PATHOLOGY: Amylase may be released into the circulation by damage to tissues containing high levels of the enzyme, or by escape from the gastro-intestinal tract.

INDICIATIONS FOR TESTING

Measurement of serum amylase is currently rarely indicated as serum lipase has higher sensitivity and specificity for pancreatitis than serum amylase.

ELEVATED AMYLASE CONCENTRATIONS IN PLASMA

High levels of serum amylase may be found in:

- Acute pancreatitis - may reach very high levels, elevated in 80% of cases within 24 hours - usually greater than 3 times the upper reference limit
- Chronic pancreatitis – usually lower levels than acute pancreatitis
- Mumps, parotitis and other salivary gland disorders
- Perforated gastric ulcer - presumably by gastric acid causing inflammation of the pancreas
- Abdominal aortic aneurism (AAA)
- Intestinal obstruction – by escape from expanded bowel wall into the blood stream
- Peritonitis – due to direct inflammation of the pancreas
- Tubo-ovarian abscess - from amylase in the fallopian tube
- Pancreatic pseudocyst - persistently increased levels seen after an attack of acute pancreatitis
- Blunt abdominal trauma
- After ERCP – may occur transiently in up to 25% of cases
- Drugs, eg morphine (closure of the sphincter of Oddie) - increase usually <3x upper reference limit
- Chronic alcoholism - often salivary in origin

- Diabetic keto-acidosis – does not usually indicate pancreatitis
- Macroamylasaemia (see below)
- Renal disease – due to decreased renal excretion

AMYLASE ISOENZYMES

Amylase is usually measured in plasma as a test for pancreatitis. Occasionally there may be confusion over the tissue origin of a raised serum amylase when salivary gland or fallopian tubes may be implicated. Usually, the simplest way to determine the likely source is to measure a serum lipase, as this enzyme is not found in the latter two structures. If necessary, the pancreatic levels can be determined by immune-precipitation using a monoclinal antibody directed against salivary amylase. As each this test may take a week before a result is available, lipase is clearly a more useful test in most cases.

MACROAMYLASE

Amylase may be bound to an immunoglobulin to form macroamylase. While there is no clinical significance to the finding of a macroamylase in a patient's plasma, it may cause some diagnostic dilemmas. A persistent elevated amylase with normal plasma lipase and no other features suggestive of pancreatic, salivary or abdominal disease is suggestive of macroamylasaemia. The diagnosis is supported by finding a normal level of plasma lipase and can be confirmed by finding a normal level of urinary amylase.