

Pancreatic Elastase 1 in Faeces

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Biochemistry

The enzyme pancreatic elastase 1 is produced by the exocrine pancreas and secreted via the Papilla Vateri into the duodenum. Under physiological conditions, elastase 1 concentration of pancreatic juice is 170 µg/mL - 360 µg/mL. The enzyme is homogeneously distributed and concentrated five to sixfold in human faeces. It is excreted unmetabolised in faeces.

Pancreatic elastase 1 (syn. faecal elastase 1) is a proteolytic glycoprotein with a molecular mass of approx. 28 kDa. In blood, the enzyme is bound to α 2-makroglobulin and α 1-antitrypsin. An increased serum concentration of pancreatic elastase 1 is an indicator of an acute pancreatitis, whereas a reduced faecal elastase 1 concentration is specific for chronic pancreatitis or pancreas insufficiency.

Patho-biochemistry

Exocrine and endocrine pancreas are strongly linked, anatomically and functionally. It is well known that disorders of the exocrine pancreas can cause malfunction of the endocrine pancreas and vice versa. New data show that micro gallstones are frequently the cause of the obstruction of the Papilla Vateri followed by a mild (clinically unsuspecting) pancreatitis. This pancreatitis is often followed by an exocrine and later an endocrine pancreas insufficiency with manifestation of Diabetes Mellitus Type IIc (diabetes due to pancreatitis). On the basis of these studies, diabetes is more frequently the result and not cause (as commonly stated in the textbooks) of exocrine pancreas insufficiency.

Clinical importance of pancreatic elastase measurement

Pancreatic insufficiency causes maldigestion and malabsorption which are followed by vitamin, mineral and trace element deficiency. Calcium deficiency increases the risk for osteoporosis and osteomalacia.

Osteoporosis and osteomalacia become clinically conspicuous only after destruction of 90% of the pancreas. This means that early detection of exocrine and endocrine pancreas disorders is important for the prevention and early diagnosis and therapy of disorders based on pancreas insufficiency. It is therefore, recommended to analyse faecal pancreatic elastase 1 in risk patients, e. g. diabetics, regardless of whether there is a clinical sign of exocrine pancreas insufficiency or not.

General indications for the analysis of pancreatic elastase 1 in faeces:

- Symptoms of maldigestion and malabsorption · Symptoms of pancreatitis.

Specific indications for the analysis of pancreatic elastase 1 in faeces:

- abdominal pain · adiposity · alcohol abuse · diabetes · diet with fast and heavy reduction of body mass · lipid-rich diet · gallstones · gall gravel · body mass loss · high oestrogen blood concentration · hypertriglyceridemia · cystic fibrosis · osteoporosis · pancreas carcinoma · pancreas resection · pathological results by ultra sound, ERCP (endoscopic retrograde cholangiopancreatography), CT (computer tomography) · steatorrhea

Preanalysis

Patient pretreatment:

None. Enzyme-substitution therapy does not interfere with the measurement of pancreatic elastase 1 in faeces. This is an important advantage of pancreatic elastase 1 analysis compared to chymotrypsin measurement. Chymotrypsin was most frequently used for the laboratory diagnosis of pancreas insufficiency so far. However it is increasingly being replaced by pancreatic elastase 1 as the more specific analyte.

Material and sampling:

Approx. pea-size aliquot of spot faeces (no 24h faeces required as for lipids in faeces). Of this sample, approx. 100 mg are used for the analysis of pancreatic elastase 1. Send at least 1 g faeces.

Liquid faeces (e. g. by diarrhoea) can cause false-positive results. In such cases, the analysis results should be interpreted with care and analysis should be repeated from faeces with normal consistency.

Sample storage and shipment:

There are no detailed studies regarding the stability of pancreatic elastase 1 in faeces so far.

Therefore, the sample should be stored at 4°C – 10°C until shipment. The sample can be sent at room temperature or frozen.

Analysis method

Liquid-liquid-extraction of pancreatic elastase 1 from approx. 100 mg faeces followed by enzyme immunoassay (ELISA) using pancreatic elastase antibodies.

Reference range

Children older than one month and adults:	>200 µg/g faeces
heavy pancreatic insufficiency:	<100 µg/ g faeces
mild/weak pancreatic insufficiency:	100 µg/ g faeces – 200 µg/ g faeces
borderline:	200 µg/ g faeces – 300 µg/ g faeces

Elevated pancreatic elastase 1 concentrations in faeces do not have any clinical relevance.

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