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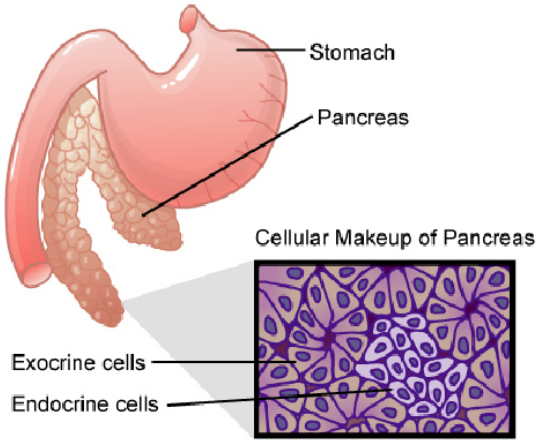
Pancreatic Disease - Testing

What is the pancreas?

The pancreas is a glandular organ located close to the liver, the stomach and the small intestine.

"The pancreas has two separate and distinct functions..."

The pancreas has two separate and distinct functions, which are its endocrine functions (functions associated with hormone production) and its exocrine functions (functions associated with enzyme production). As an endocrine organ, the pancreas controls blood sugar levels through the secretion of insulin and glucagon hormones. As an exocrine organ, it aids in digestion through the secretion of lipase and amylase enzymes.



What types of pancreatic disease may occur?

Functionally, pancreatic diseases are broadly classified into diseases related to the exocrine portion of the pancreas (that is, diseases related to the digestive functions of the pancreas), and diseases related to the endocrine portion of the pancreas (that is, diseases related to the control of blood glucose).

Pancreatitis is generalized inflammation of the pancreas. Depending upon the degree of inflammation, there may be long-term effects with respect to either the exocrine or the endocrine pancreatic functions. The underlying cause of pancreatitis is often not known but it may be related to the recent consumption of a fatty meal, or direct trauma to the pancreas.

Rarely, tumors of the pancreas may occur. These tumors usually involve the pancreatic beta cells (these cells manufacture insulin) but other tumors of the pancreas may also occur.

How is exocrine pancreatic disease diagnosed?

The clinical signs that a pet exhibits give us the first 'clues' that exocrine pancreatic disease might be present. Disease of the exocrine portion of the pancreas results in insufficient production of the enzymes required for proper digestion of fats, carbohydrates, and proteins.

This condition is termed exocrine pancreatic insufficiency. The patient with this problem usually produces large quantities of fatty feces and shows gradual weight loss despite a good appetite. This condition can occur in dogs because of previous episodes of pancreatitis, or it may be a congenital or inherited condition. Certain breeds of dogs seem to be predisposed to developing this problem.

The most sensitive and specific test for diagnosing exocrine pancreatic insufficiency is determination of the trypsin-like immunoreactivity (TLI) in a serum sample. This involves taking a single, fasting blood sample that is then sent to a veterinary referral laboratory for TLI determination.

Trypsinogen is a proenzyme (a non-activated enzyme) that is secreted by the pancreas into the small intestine, along with other pancreatic digestive enzymes. Upon reaching the small intestine, trypsinogen is converted to *trypsin*, an enzyme that is involved in the digestion of proteins. A small amount of trypsinogen escapes from the pancreas into the blood circulation, and can be measured in a blood sample as trypsin-like immunoreactivity. Dogs with exocrine pancreatic insufficiency have less trypsinogen being produced because of reduced functional pancreatic tissue, and therefore less trypsinogen escapes into the circulation. Therefore, the trypsin-like immunoreactivity in serum from a dog with exocrine pancreatic insufficiency is quite low.

Do all dogs with pancreatic insufficiency have decreased trypsin-like immunoreactivity blood values?

"The pet must be fasted prior to testing."

Typically, by the time that clinical signs of exocrine pancreatic insufficiency are apparent, most dogs will have significantly reduced concentrations of trypsin-like immunoreactivity. However, if a dog has concurrent pancreatitis or if a sample is taken shortly after a meal, the amount of trypsin-like immunoreactivity may be temporarily increased into the normal range. This is the reason why the pet must be fasted prior to testing.

Are there any other tests that may be used to diagnose exocrine pancreatic insufficiency?

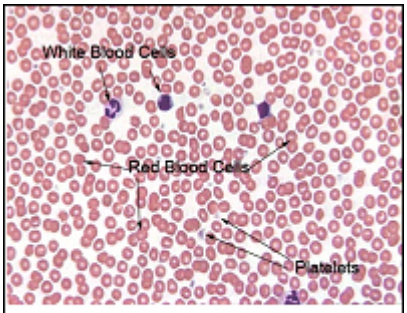
Determination of B12 (cobalamin) and folate concentrations in a serum sample may provide supportive evidence of exocrine pancreatic insufficiency.

Both B12 and folate are vitamins that are readily available in most commercial diets, so dietary deficiency is unlikely. Because pancreatic digestive enzymes are required for the proper absorption of B12 from the digestive tract, exocrine pancreatic insufficiency may result in decreased serum concentrations of B12. Folate concentrations may be increased in serum samples from dogs with exocrine pancreatic insufficiency because intestinal bacterial overgrowth accompanying the insufficiency results in increased bacterial production of folate.

How is endocrine pancreatic disease diagnosed?

The endocrine portion of the pancreas is involved in the regulation of blood sugar. This is accomplished primarily through the effects of the hormones insulin and glucagon. A deficiency in insulin results in diabetes mellitus (sugar diabetes). Testing for diabetes mellitus is discussing in the handouts entitled "Diabetes in Dogs - Testing and Monitoring" and "Diabetes in Cats - Testing and Monitoring".

How is pancreatitis diagnosed?



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Inflammation of the pancreas (pancreatitis) may occur due to many factors. In addition to clinical signs that may include inappetence, vomiting, fever, and abdominal pain, certain characteristic laboratory changes support a diagnosis of pancreatitis.

The CBC (complete blood count) may reveal an increase in the number of white blood cells due to the inflammation within the gland. In addition, the PCV (packed cell volume), which is an indication of the total mass that the red blood cells are occupying in circulation, may be increased because of dehydration.

The serum biochemistry profile may reveal increases in the pancreatic enzymes amylase and lipase. Amylase and lipase are enzymes involved in the digestion of starches and fats, respectively. Normally these enzymes are not active until they are secreted into the digestive tract, but with pancreatitis, they become prematurely activated and cause damage to the gland itself. This premature enzyme activation and leakage also results in increased amylase and lipase concentrations in the serum. Although the increases in amylase and lipase can be variable, they are often quite dramatic.

Are these tests definitive for pancreatitis?

No. Any inflammatory condition may cause white blood cell numbers to become increased. Similarly, any condition resulting in dehydration can cause an increase in the PCV. Conditions that have been shown to cause mild increases in amylase and lipase include kidney disease, neoplasia (cancer), gastrointestinal disease, and liver disease.

"Any inflammatory condition may cause white blood cell numbers to become increased."

The remainder of the serum biochemistry panel provides additional information in regards to the function of these other organs, helping to determine the specific cause of increases in amylase and lipase.

Despite having strong clinical evidence of pancreatitis, some animals, especially cats, will not have significant increases in lipase or amylase enzymes in a serum sample.

Are there any other tests that may be used for the diagnosis of pancreatitis?

Recently, serum tests that appear to be more specific for lipase originating from the pancreas have been developed for the dog and cat. These tests quantify the amount of canine pancreatic specific lipase immunoreactivity (cPLI) or feline pancreatic specific lipase immunoreactivity (fPLI) within a serum sample, and may be helpful in distinguishing increases in serum lipase values due to pancreatitis from increases due to other causes. For further information, please see the articles entitled "Pancreatic Lipase Immunoreactivity Testing in Dogs" and "Pancreatic Lipase Immunoreactivity Testing in Cats".

Occasionally other procedures such as x-rays or ultrasound evaluation of the abdomen are helpful in the diagnosis of pancreatitis when laboratory testing fails to provide a definitive answer.

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