

Exocrine Pancreatic Insufficiency (EPI)

What is Exocrine Pancreatic Insufficiency (EPI)?

The pancreas is a vitally important organ that plays a key role in various processes in the body, including but not limited to, production and release of digestive enzymes and hormones responsible for glucose regulation.

Digestive enzymes (amylase, lipase, proteases, others) are released from the pancreas into the small intestine and aid digestion of food and absorption of nutrients (carbohydrates, fats, proteins, vitamins, others). When the pancreatic cells responsible for production of these enzymes are damaged or lacking, the inadequate enzyme secretion results in malnutrition despite adequate food intake. This is called **Exocrine Pancreatic Insufficiency (EPI)**. Since many animals affected by EPI are undiagnosed and untreated, owners often elect to euthanize their pets as the animals appear to be starving despite adequate food intake.

In most patients with EPI only the digestive part of pancreas is destroyed and blood glucose regulation is unaffected; however in a minority of cases the endocrine pancreas is also damaged and those patients develop concurrent diabetes mellitus.

In dogs, EPI is most commonly caused by decrease in the size and number of pancreatic cells responsible for production and secretion of digestive enzymes, known as pancreatic acinar atrophy (PAA), and in some breeds is believed to result from immune-mediated destruction of these pancreatic cells, secondary to a probable genetic predisposition. In a minority of cases the underlying cause is chronic pancreatitis (ongoing or long standing inflammation of the pancreas tissue). Very rarely EPI may be present from birth secondary to abnormal development of the pancreas.

What breeds are affected?

While some breeds, including German Shepherd Dogs (GSD) worldwide, Rough Collies in Finland and Chow Chows in the United Kingdom, seem to have EPI more frequently than others; any breed may develop this disease. Many people consider EPI be a disease of GSDs, but several surveys have shown more than one half of affected dogs with EPI are **not** GSDs.

What are the clinical signs of EPI?

Signs of EPI are highly variable and the signs seen depend on the dog's diet and how much time has elapsed since the onset of the pancreatic disease. In general there is progressive weight loss despite normal or increased appetite, as well as frequent passage of large amounts of light-colored, semi-formed feces. Other dogs will vomit periodically, and appetite may be intermittently decreased. In later stages of the disease, dogs will develop ravenous appetites and eat their own stools or other inappropriate material. Increased rumbling sounds from the abdomen and excessive passage of gas (flatulence) are also common and are often the first signs noticed by owners.

How is the diagnosis made?

This disease is easily and accurately diagnosed by a test that measures the concentration of trypsin-like immunoreactivity (TLI) from a blood sample collected after food has been withheld for 12 hours. The serum TLI concentration reflects the functional mass of pancreas and patients that are showing signs of EPI will have TLI levels much lower than normal animals.

The TLI normal ranges in units of ug/L are:

	Healthy Control Animals	EPI
Canine	5.7 - 45.2	2.5 or less
Feline	12.0 - 82.0	8.0 or less

As with all clinical tests, the results of the test will need to be interpreted by your veterinarian in light of the clinical signs and other health conditions noted in your pet.

It is strongly advised that when serum TLI is evaluated, for the first time at least, serum cobalamin (vitamin B12) and folate (water-soluble B vitamin) should also be evaluated. Many patients with EPI are cobalamin deficient and some have abnormal serum folate. Some patients do not respond well to treatment unless such abnormalities are identified and corrected with specific treatments.

What is the treatment for EPI?

Patients with EPI almost always require treatment with replacement pancreatic enzymes ingested at the time of feeding. These enzymes are needed to reverse clinical signs and return to optimal body condition. Many patients also do better when fed a highly-digestible low fiber diet. Some require specific vitamin supplementation and antibiotic therapy. Finally, some patients have other concurrent digestive system

abnormalities that may require additional treatments.

ENZYMES:

Commercially available enzymes are powdered extracts of porcine (pig) pancreas. Tablet and enteric coated preparations are often less effective and in some individuals ineffective. Raw pancreas from several species may also be used if available, and may be stored frozen for many months without losing their effectiveness. While less expensive, enzymes from plants and other sources are not potent enough to be effective substitutes for pancreatic extracts and should not be used. Not all pancreatic extracts contain the same concentrations of enzymes, but the content should be clearly stated on the packaging.

The amount of extract required to maintain adequate nutrient absorption is ultimately a matter of trial and error, but it is important the initial dose is sufficiently high. You will need to work closely with your veterinarian to determine the optimal amount of extract for your animal. Once a good clinical response is achieved, the lowest dose that has a satisfactory response needs to be given with each meal (and this will vary with different diets).

Scientific studies have indicated there is no nutritional benefit in "pre-incubating" by mixing the pancreatic extract and food together and allowing them to be in contact for a period of time prior to feeding. However pet owners have stated that they have seen a benefit from this practice. Preincubation probably has few risks and so if pet owners do not mind the inconvenience, "pre-incubation" is unlikely to harm.

Side effects of pancreatic supplementation are rare but owners should monitor their animals closely especially when starting supplementation with extract or when increasing doses. The most common side effects include inflammation of the mouth (including bleeding from the gums) and an unpleasant breath odor. These signs may be reduced or eliminated by using a lower dose of extract. Feeding a highly digestible, low fiber diet will help reduce the amount of extract required as these foods require fewer enzymes for the food to be digested and absorbed by the patient.

DIET:

Many dogs with EPI have done well when fed the enzymes along with whatever diet they were being fed before developing EPI. Controlled scientific trials have indicated that most dogs have improved success with treatment when fed a highly digestible diet that contains little poorly-digestible fiber. Some fermentable fiber is beneficial for the gut, but some unfermentable or insoluble fiber types may inhibit the effectiveness of enzymes and should be kept to minimum. Low fat diets should be avoided in most dogs with EPI as they will usually lose body condition with fat restriction. Ultimately, you and your veterinarian will need to decide on the diet that is best for your dog and current situation, bearing the above guidelines in mind. What is effective for one dog may not be helpful for another.

Nutrient absorption in affected animals will rarely return to 100% of normal, even when all clinical signs appear to resolve. Most animals will compensate by eating slightly more than normal to maintain body condition. Affected animals usually return to near normal weight and condition over several weeks to months when appropriate treatment is started. In the short-term, additional meals may be fed to help speed return to normal body weight.

ANTIBIOTICS:

Due to the abnormal digestion in dogs with EPI, the small intestine may contain more bacteria than normal and in some patients there may be an abnormal balance of bacteria. This is referred to as small intestinal bacterial overgrowth or dysbiosis. In some cases, this leads to persistent diarrhea or failure to gain weight, especially when combined with malnutrition and perhaps cobalamin deficiency. Antibiotic therapy may be helpful in these cases. Diets containing prebiotics or probiotic supplements may also be helpful. If diarrhea relapses on cessation of antibiotic therapy then low doses of a specific antibiotic may be prescribed by your veterinarian to be given with one of the daily meals. This has been effective in many cases and may be required indefinitely for an optimal clinical response. There is little information for cats, but if diarrhea persists after enzyme replacement, a low carbohydrate content dry food diet may be helpful.

COBALAMIN AND OTHER VITAMINS:

Both dogs and cats diagnosed with EPI are ultimately quite likely to develop severe cobalamin deficiency and should have serum concentrations of this nutrient evaluated periodically. Patients with normal results at the time of diagnosis of EPI almost always become deficient over the next couple of years. Even with otherwise successful treatment EPI patients that do not receive cobalamin will eventually relapse with signs of deficiency, including poor appetite, poor hair coat, weight loss and diarrhea. Fortunately, this deficiency is easily and inexpensively treated by periodic injections of cobalamin (not multivitamin mixtures that may be painful). Weekly cobalamin injections are usually given until blood concentrations return to normal, after which lifelong monthly injections will prevent recurrence of deficiency.

Other nutrient deficiencies (folate, tocopherol (vitamin E) and vitamin K) have been shown to develop in some individuals with EPI despite otherwise effective treatment with pancreatic extract, and these possibilities are sometimes evaluated. Vitamin K deficiency, while rare, may lead to life-threatening bleeding problems. If present, each is easily and specifically corrected by appropriate supplementation. It is possible other nutrients may not be absorbed normally in patients with EPI, but little scientific information is available.

To learn more about living with an EPI dog and/or to participate in a support group for EPI management, please visit [epi4dogs](http://www.epi4dogs.com) at

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