



Image 1, Dexter June 2012

17 week old Dexter, a lurcher cross, was rehomed by Fiona Buchanan in May 2011. He had suffered severe neglect along with his mother and siblings since birth and had been removed from that environment at 15 weeks old.

During the first year of owning Dexter, Fiona had tackled a few bouts of diarrhea that were treated with antibiotics. At his first yearly vaccination the vet noted Dexter weighed 17.4kgs, 3 kilos below his ideal body weight. The vet advised Fiona to increase Dexter's food but this seemed to cause severe diarrhea so Fiona dropped it back to the original amount. In June 2012 Dexter developed dietary indiscretion that progressed into watery diarrhea.

Over the following weeks he was treated for parasites, given more antibiotics, probiotics and put on to a prescription Allergen-Free diet with novel proteins. During all this Dexter was put through several blood tests and regular stool samples were taken. The watery diarrhea stopped, but was replaced by soft yellowish stools.

By September Dexter's weight loss was becoming quite drastic and his temperament was changing. He had gone from a boisterous, friendly, active dog to a subdued, quiet boy who was becoming aggressive towards Fiona's cats.



Image 2, October 2012

By October Dexter's weight had dropped to a dramatic 14.3kgs. He had a ravenous appetite and was regularly passing grey 'cow pat' stools. Dexter was puzzling the vets; they discussed full body scans, biopsies and referring him to specialists. Then the vet Fiona was working with came up with one last idea. To test Dexter for a condition called Exocrine Pancreatic Insufficiency (EPI).

What is Exocrine Pancreatic Insufficiency? (EPI)

EPI is the inability of the pancreas to produce and secrete the necessary enzymes needed to digest food.

These enzymes are:

- Amylase for digestion of carbohydrates (sugars & starches in grains, fruits & vegetables).
- Lipases for digestion of fat.
- Trypsin and Proteases-for digestion of proteins.

(DiMagno EP, Go VL, Summerskill WH 1973).

Without a steady supply of these enzymes the body can't break down and absorb nutrients, meaning the dog literally starves.

Incomplete digestion causes the continual presence of copious amounts of fermenting food in the small intestine (Williams. D.A. et al 1987). This can lead to a secondary condition, common in many EPI dogs, named Small Intestinal Bacterial Overgrowth (SIBO).

The condition occurs when bacteria that is feeding on the fermenting food overpopulates the tissue lining of the small intestine, further impairing the proper absorption of vital nutrients and depleting the body's store of vitamin B12. This then causes the body to develop a B12 deficiency (Kennedy .O.C 2009).

Causes of EPI?

It's believed that EPI has both an environmental and genetic origin; the exact mode of inheritance is not known (Kennedy .O.C 2009).

Prior research suggested that EPI was inherited in an "autosomal recessive" manner (i.e., both parents had to be carriers for a dog to get EPI); however, it's no longer believed that both parents must be carriers in this manner. Latest research by Dr. Leigh Anne Clark and her Research Associate, Dr. Kate Tsai of Clemson University yielded new findings to help understand the causes of EPI. The study found that autoimmune reactions which can destroy digestion-related parts of the pancreas play a key role. These autoimmune reactions were found to have a relationship to a certain chromosome and a particular gene. The "alleles" associated with this particular gene appear to be significant. Dogs that had one particular allele associated with this gene had an increased EPI risk. Dogs that had other alleles associated with this gene appeared to have more protection from EPI (Kennedy 2009).

Certain illnesses, such as chronic pancreatitis, can lead to EPI. Although pancreatic tumors (such as insulinoma) are not common, pancreatic surgery related to a tumor can lead to EPI symptoms. Each time a dog gets pancreatitis, small portions of the pancreas can become permanently damaged from scarring or necrosis (tissue death). The more damage done, the greater the risk of EPI occurring (GlobalSpan 2008).

Symptoms of EPI

- Runny "Cowpie" stools

This is one of the most common symptoms of EPI & may be the first sign the owner sees yellow, orange, grey, or pale-coloured stools.



Image 3, EPI stool

- Much greater quantity of stools than normal and may occur several times a day
- Food is passing through the dog's body without being used

Rapid weight loss

- Normally occurs since the dog is literally starving to death
- It's not unusual for a 100 lb dog to lose 1/2 lb a day

Ravenous appetite (polyphagia)

- Loss of appetite is associated with SIBO and/or B12 deficiency (both often accompany EPI)

Gas (burping, flatulence, etc.)

- Very common early symptom of SIBO
- Higher risk of Bloat due to gas

Dry, dull, or brittle coat

- Possibly excessive shedding too

Vomiting, regurgitation, throwing up, or wet burps

- May be mostly liquid (often brown)

Eating stools / feces (coprophagia)

- Quite a few EPI dogs do this
- May accompany SIBO due to malabsorption

Temperament changes showing fear and/or aggression

- Some EPI dogs understandably become temporarily aggressive because they're starving to death
- B12 deficiencies can affect cognitive functions
- SIBO creates on-going abdominal discomfort which may aggravate behaviour issues

How to test for EPI

- A trypsin-like immunoreactivity (TLI) determination is primarily used for the diagnosis of exocrine pancreatic insufficiency. This disease involves the portion of the pancreas that produces digestive enzymes. Insufficient enzyme production results in improper digestion of fats, carbohydrates, and proteins (Williams.D.A & Batt.R.M 1986).

The TLI test is highly sensitive and specific for the diagnosis of canine exocrine pancreatic insufficiency (EPI). This test measures the concentration of trypsin-like proteins in a blood sample by radioimmunoassay (Williams.D.A & Batt.R.M 1986).

- In normal dogs the TLI concentrations are greater than 5.5µg/L
- In dogs with exocrine pancreatic insufficiency TLI concentrations are less than 2.5µg/L
- On October 18, 2012 Dexter's results came back showing a shocking TLI level of only 1.5 µg/L. This was evidence that Dexter's body was not following a normal digestive process and proof that he was confirmed with EPI.

Management of EPI

There is no quick fix or simple solution for EPI. It is all about finding what is right for the individual dog. Dexter was prescribed Pancreatic Enzymes for cats and dogs to promote better digestion. Within a few days Dexter's stools were becoming more solid. Over time he slowly began to gain small amounts of weight and his aggression towards the cats had stopped.

Enzyme supplementation is the first step in managing EPI. The best results are usually obtained with freeze-dried, powdered porcine enzymes rather than plant enzymes or enzyme pills. Plant enzymes and enzymes in a pill form do work for some, though with enzyme supplements, as with diet, much is dependent on the individual EPI dog (Kennedy.O.C 2009). Some of the most widely used prescription enzyme supplements are Viokase, Epizyme, Panakare Plus, Pancrease-V, and Pancrezyme. Enzyme Diane is a non-prescription generic equivalent (Kennedy.O.C. 2009).

Some EPI dogs have allergies and cannot tolerate the ingredients in the most common enzyme supplements. Those owners learn to develop alternative methods such as using plant enzymes, or a different source of pancreatic enzymes such as beef-based (rather than porcine-based) (Tom 2011). Raw beef, pork, or lamb pan-

creas can also be used. One to three ounces of raw chopped pancreas can replace one teaspoon of pancreatic extract (Kennedy.O.C 2009).

The starting dosage of prescription enzymes is usually one level teaspoon of powdered enzymes per cup of food. As time goes on and a dog stabilizes, many owners find that they can reduce the amount of enzymes administered with each meal, sometimes to just ½ teaspoon per cup, although some EPI dogs require an increased dosage of enzymes in their senior years (Kennedy.O.C 2009).

Supplements for an EPI diet

Whether the dog is fed dry, canned, home-cooked, raw, or any combination, there are many supplements that may be added to provide additional benefits for EPI dogs (Esternarck.E & Wilberg.M 2006). Wild Salmon Oil is used by many EPI dog owners who alternate between that and cold pressed, unrefined coconut oil. Coconut oil consists of approximately 90% saturated fats and most of those fats are Medium Chain Triglycerides (MCTs). The main component of the MCTs in coconut oil is lauric acid, which is antiviral, antifungal, antibacterial and helps to balance the immune system. MCTs are an excellent source of energy and are extremely easy to digest, as they do not require lipase or gall bladder bile to digest, making it easily processed in the body (Westernarck.E. et al 1995).

Probiotics are another important addition to the EPI diet, especially since most EPI dogs are, or have been, treated with antibiotics because of SIBO. Antibiotics wipe out not only bad bacteria, but also good bacteria. Probiotics help maintain good gut flora. One popular brand of probiotics that has been successfully used by EPI owners is Primal Defense, but there are many quality probiotics available.

Other natural nutrient sources that are often included in an EPI diet are kelp, green tripe, slippery elm, and alfalfa (Kennedy.O.C 2009).

A common saying among those whose dogs have EPI is, “If you’ve met one EPI dog, then you have met just one EPI dog.” Even with pancreatic enzyme supplements, much of the health and well-being of each EPI dog depends on his diet. Sometimes all that is needed are supplemental enzymes and the standard recommended dietary modifications: no more than 4% fibre and no more than 12% fat (Kennedy.O.C 2009).

Recommendations keep evolving and changing with new research, as well as the feedback from networks of owners of EPI dogs. A recent change in feeding recommendations concerns dietary fat. Multiple studies from the past decade indicated that a fat-restricted diet is of no benefit whatsoever to the EPI dog. A 2003 paper by Edward J. Hall, of the University of Bristol in England, states that there is experimental evidence to show that the percentage fat absorption increases with the percentage of fat that is fed. This may explain why some EPI dogs can tolerate higher concentrations of fat. Veterinarians usually recommend an initial diet of a prescription or veterinary food, such as Hill’s Prescription Diet w/d, i/d, or z/d Ultra Allergen-Free; Royal Canin’s Veterinary Diet Canine Hypoallergenic Diet or Digestive Low Fat Diet. Prescription diets that are made with hydrolyzed ingredients (carbohydrates and proteins that have been chemically broken down into minute particles for better absorption in the small intestine, leading to more complete di-

gestion, better/faster weight gain, and firmer stools) appear to work for some EPI dogs but not the majority. Unless there is a concurrent condition requiring this food, a prescription diet is not necessary. A grain free diet with 4% or less fiber is what works for the majority.

Dexter's EPI Management

By January Dexter's stools were becoming soft and his aggression was resurfacing. Fiona had been researching EPI and had found Epi4Dogs Foundation where she was advised to look into his vitamin B12 levels and also advised that he was showing many of the symptoms linked with SIBO. Fiona approached her vet and Dexter was put on a course of B12 injections and Metronidazole for the SIBO.

Those animals who are not properly treated for B12 deficiency will have a very poor prognosis and will not show improvement when only treated for EPI. Because animals with EPI are unable to absorb certain nutrients and have a diminished capacity to produce intrinsic factor, giving them oral B12 supplementation without intrinsic factor will not help. Thus, the most effective method of vitamin B12 supplementation is by injection (PetMD 2013).

The dog will continue to receive injections of B12 until levels are high enough and any secondary intestinal problems are improved. Once an animal has a normal level of B12 in the bloodstream, it should begin to gain weight and improve considerably, even in the face of EPI (PetMD 2013).

Once again Dexter's temperament began to improve but the SIBO persisted. The vet changed Dexter's antibiotics to Oxytetracycline and the SIBO began to clear up. As before though, when the antibiotic course was finished the SIBO kept returning.

Fiona and the vet decided that a grain free diet may be easier to digest and help Dexter overcome these bouts of SIBO. However, changing an EPI dog's food is not a simple task. With each new food they tried, Dexter would suffer with severe acid reflux which meant that changing his food was a lengthy process. Eventually Dexter was able to be settled on Millies Wolfheart Gundog Mix. Dexter seemed to settle and seemed to be suffering less with SIBO flare ups.

In June 2013 Fiona changed Dexter's enzyme medication to Panzym; Dexter had been emitting a smell of sour milk whilst on Pancreatic Enzymes for cats and dogs. The Panzym was successful and Dexter's smell of sour milk reduced.

Over the next few months, although he suffered with SIBO flare ups, Fiona was treating Dexter at home with the antibiotic Oxytetracycline when necessary. Dexter was slowly gaining weight and by August 2013 his weight had reached 17.5kg. He seemed back to the healthy, energetic dog he had been before his illness. In October the antibiotics were changed to Tylan and in November Fiona introduced coconut oil to his food.

Dexter began to pile on the weight and reached an excellent 19.7kg. He is now living a full and happy life with the careful management of Fiona.



Figure 4, Dexter 2014

What if Dexter had been a hearing Dog?

With Dexter's illness it was not clear until he was 21 months old that he was suffering with EPI. Although he had displayed some symptoms in puppyhood, they had only been minor incidents.

At this stage Dexter would likely be in placement, working with a recipient. Due to the nature of the condition it would have to be discussed as to whether the recipient could cope with the long term commitment of maintaining Dexter's health.

With this condition, it is not only the dog that suffers, the owners can too. When considering a dog, the recipient is, of course, also taken into account. Could this condition cause the recipient to become anxious? Is their lifestyle suited to the dog's condition? Would they cope with the condition when it was flaring up badly? Is it fair for the charity to ask them to? The charity would need to provide a strong network of support for the recipient and be in direct contact with the vets to ensure all information was being communicated well.

Financial matters would also have to be considered. Should the charity help with payments? Can the recipient afford to pay for the treatments/management needs?

What if Dexter was in the advanced stages of training?

If Dexter was in training when not stable, the following areas would have to be considered:

- Frequency of diarrhea and vomiting - This, for example, would need to be taken into consideration when looking for a match for the dog. If the recipient worked, it may be unsuitable to place this particular dog with them. A quieter match would most likely be more suited to a dog with EPI simply due to the common symptoms of the condition.
- Triggers for flare ups.
- Extent of weight loss - It would need to be taken into consideration how often the dog may need to visit the vet to monitor its weight. A less experienced recipient may not notice the weight loss, whereas a more experienced recipient is more likely to notice.
- Type of food rewards used - What food would be the most suited to the dogs health?
- Triggers for the condition to flare up such as stress - If stress is a contributing factor, the charity would have to evaluate if the dog copes with changes in its life or if it becomes stressed. For example, if the condition flares up when the dogs goes to a new B&B socialiser, then it is likely to flare up when it is placed with a recipient.
- Behavior - EPI dogs can display aggressive behaviors due to the fact that they are literally starving to death. They may begin stealing food and eating inappropriate items. The pain that can be caused by this condition may also have an effect on their behaviour; they can become more sensitive to touch, even fearful of certain areas being handled. Finally, B12 can affect cognitive functions which will affect a dog's behavior. The dog would have to be matched to a very specific recipient. They would have to be able to understand and cope with the condition and, of course, be happy to take on a dog that will need lifelong careful management.

Conclusion

- EPI is becoming more prevalent and appearing in more breeds of dogs. It is not a condition that can be cured, but it can be managed. Many dogs that suffer with EPI can live long and fruitful lives. With the correct care and attention, an EPI dog could become a hearing dog but it would require extra support from the charity.
- Each EPI dog is different and the severity of the illness can vary widely. Dexter suffered badly in the beginning but with care, attention and support he is now living a full and happy life. Fiona has his EPI at a manageable level and through trial and error she has found what is right for him.

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Image References

Image 1, Dexter 2012. Personal photograph by Fiona Buchanan

Image 2, October 2012. Personal Photograph by Fiona Buchanan

Image 3, EPI Stool. Kennedy, O C. (2009). Exocrine Pancreatic Insufficiency in Dogs. Available: http://www.whole-dog-journal.com/issues/12_3/features/Exocrine-Pancreatic-Insufficiency-in-Dogs_16109-1.html. Last accessed 14/11/2014.

Image 4, Dexter 2014. Personal photograph by Fiona Buchanan