Diabetes

What is Diabetes?

Diabetes mellitus is a disease where the body is unable to properly regulate blood sugar, because of a deficiency of a hormone called insulin.

What are the symptoms?

There are four classic symptoms of diabetes:

- **Increased thirst**
- **Increased appetite**
- **Increased urination**
- **Weight loss**

There are other diseases that will produce these signs – but together they are very suggestive of diabetes. However, you may not always see all four symptoms. The appetite may be reduced by other illnesses or complications of the diabetes. And you may not notice how much your pet is drinking or urinating (especially in cats). If you see any of these symptoms, you should have your pet examined by one of our vets. Diabetes will make your pet very sick and eventually can be fatal.

Diabetes is a serious disease and must be treated.

For an explanation of why these symptoms develop, refer to *"What does insulin do?"* later in this brochure.

Are there any long-term side-effects?

Yes, unfortunately there are many other serious side-effects of undiagnosed or poorly-managed diabetes. Excess glucose in the bloodstream will cause damage to nerves, small blood vessels and a number of vital organs. Diabetes can lead to blindness (from cataracts or retinopathy), kidney failure and nerve damage. It also increases the risk of developing many other diseases such as bladder infections and adrenal disease.

Which animals are more likely to get diabetes?

Diabetes is more common in dogs than cats. It occurs in middle to old-age dogs, more often in females. Some breeds are more commonly affected than others, including miniature poodles and schnauzers.

Diabetes is an uncommon disease in cats, but is seen more frequently in middle to old-age cats and more common in males than females. Burmese cats are more commonly affected than other breeds.

Overweight animals are also much more likely to develop diabetes.

In some cases, particularly in cats, diabetes may occur secondary to other factors such as obesity, pancreatitis or drug administration. Removing these predisposing causes may eliminate the signs of diabetes. Unfortunately though, most pets will have diabetes for the rest of their life.

How is diabetes diagnosed?

The diagnosis of diabetes is based on 3 criteria:

1) the four classic symptoms (see above)
2) persistently high blood glucose
3) glucose in the urine

Normally, the level of glucose in the blood is closely controlled in the range of 4 – 8 mmol/L. It may rise to 10mmol/L following a large meal. But with diabetes, blood glucose may rise over 20 or even 30mmol/L.

In many dogs, a single urine and blood test (which we can perform immediately here at the clinic), along with supporting symptoms, may be enough to make the diagnosis of diabetes. However, we will always want to recheck this and confirm that the blood glucose is persistently elevated. In cats, things can be more difficult, as blood glucose levels can rise simply in response to stress. If there is any doubt, a laboratory test (*blood fructosamine*) can be ordered, which gives an idea of the average blood glucose level over the previous 2-3 weeks. This can help us to differentiate true diabetes from stress associated with another illness.

At the time of diagnosis, your pet will need a complete physical examination, full blood count, biochemistry profile and urine tests. Even if we have made the diagnosis using simple in-clinic tests, the other tests are still important. Diabetes has many potential complications and may be associated with other diseases. These also need to be identified and treated if the diabetes is to be managed successfully.

Treatment

Diabetes cannot usually be cured, but it can be very successfully managed. Treating a diabetic pet need not be too difficult, and can be rewarding. It does however demand considerable commitment from the owner.

Initially, several hundred dollars will be spent stabilising the patient, and possibly much more if complications have developed. But once well regulated, the maintenance costs are not too bad.

Treatment for dogs (and most cats) requires **twice daily injections of insulin** for the rest of your pet's life. Many pet owners initially think that they could never do this - yet most people learn quite quickly. The needles are tiny and relatively painless. Please don't decide against treating your diabetic pet simply because you are scared to give injections - you will be pleasantly surprised how easy this is. We will discuss injection technique in more detail shortly.

The other factor that should be considered is the long-term commitment involved. Your pet will need **insulin injections every morning and night** (ideally at 12-hour intervals). Whilst missing an occasional dose will cause no major crisis, you need to see these injections as an essential part of your pet's daily care, which includes holidays, weekends away, etc. **Feeding must also be regulated** (with consistent measured amounts of food after each insulin injection). We will discuss feeding in detail shortly too. **Regular daily exercise** is also recommended. Poor control of your pet's diabetes will reduce their quality of life and can lead to serious long-term complications (see earlier). Another problem, which can arise, is **hypoglycaemia** and you need to know how to recognise this and treat it immediately.

If you are unable to commit to this long-term care, then unfortunately it may be necessary to consider euthanasia. Dogs (and many cats) simply can't survive without regular insulin injections. Our staff will understand your concerns, answer your questions and guide you in making this important first decision.

In-Hospital Treatment:

In most cases, your pet will be hospitalised initially, even if it's just overnight while we wait for test results (and while you have time to consider your decision regarding treatment). Insulin injections can be started by our staff. In severe cases, *diabetic ketoacidosis* may have developed (discussed later) and a longer stay in hospital with more intensive treatment will be required.

Care at Home:

As soon as we think your pet can cope at home, an appointment is made to discharge them from hospital. Our staff will teach you how to care for your pet at home. This will include instructions on:

- Diet
- Insulin injections
- Monitoring
- "Hypo" awareness
- Exercise

We'll give you a starting dose for insulin injections and advise an amount of food to give, but these amounts will have to be tailored to your pet over the coming weeks.

We don't expect you to learn all of the details of diabetic management at this first visit. But you need to understand the basics. It is important that you pay close attention and follow all of our instructions. We've prepared this brochure to back-up what we've told you and to answer many other questions. And if you have any concerns, help is just a phone-call away.

Diet

The first step in home treatment is to review your pet's diet. The ideal diet for a diabetic pet should be high in fibre and low in fat and sugar. Special prescription diets are available (eg. *Hill's Prescription Diet w/d*) to meet these needs. However, if your pet is fussy (or a change in diet seems like just too much hassle and expense) we can base your pet's treatment around its existing diet.

The most important thing is that **the diet needs to be consistent** – the same amount of the same food at the same time every day. We will be attempting to match your dog's insulin dose to its diet, and this is impossible if the diet varies from day to day. See *Blood Glucose Levels* for more details.

In cats, an alternative is a low-carbohydrate, high-protein diet such as *Hill's Prescription Diet Feline m/d* (especially if they are also overweight). This is similar to the *Atkins* diet sometimes used for weight loss in people. This type of diet is not recommended for the treatment of diabetes in people, but it can be a good option for some cats. Cats are *obligate carnivores* (meat-eaters) so a high protein diet is actually quite natural for them.

Ideally, the food must be timed so that it is absorbed from the intestines at the same time that the insulin injection is having its effect. This can vary from patient to patient, but generally we advise feeding approximately **1 - 1½ hours after the insulin injection**. The total daily food should therefore be broken down into 2 equal meals each day. Some animals (especially cats) don't eat a meal, but instead graze on food all day. Cats that eat in this fashion should be fed a low-carbohydrate diet (*Hill's m/d)*. Dogs should be converted to 2 equal meals per day if at all possible.

Do not give any titbits or treats (and make sure no-one else does either).

Always provide **plenty of fresh water**.

If your pet is overweight, then this must be corrected, because obesity makes the management of diabetes much more difficult. A special diet may be prescribed to help your pet lose weight (eg. *Hill's Prescription Diet r/d* or *Hill's Prescription Diet Feline m/d*)

Insulin Injections

Treatment for dogs (and most cats) requires **twice daily injections of insulin** for the rest of your pet's life. Many pet owners initially think that they could never give their pet an injection - yet most people learn quite quickly! The needles are tiny and relatively painless, and the amount of insulin injected is very small. The injections are given just under the skin and it is almost impossible for you to cause any harm to your pet.

Our staff will show you how to give the injections, and will allow you to practice under our supervision until you are comfortable with the procedure.

Storing and Handling Insulin

Insulin is a hormone and is provided in a small glass phial that is labelled with the type and concentration of insulin (see *Insulin Types* later). Insulin will lose its effectiveness if exposed to direct sunlight or high temperatures. It should be stored in the refrigerator but never allowed to freeze. Insulin will **not** be destroyed if it is left out of the fridge for a day or two (unless in direct sunlight or very high temperatures) but this is not advisable.

Many insulins are provided as a suspension (small particles of insulin suspended in a clear liquid). These insulins must be **thoroughly mixed** before each use, but **never shaken**. Mixing by slowly rocking the phial is the best way. Vigorous shaking can damage the insulin.

Preparing the Insulin Dose:

1) Remove the insulin from the fridge and have the insulin bottle, syringe and needle and your pet ready. If your pet won't stand still on command, it may be best to have someone help you while you're learning the injection technique.
2) Remove the insulin bottle from its box and mix gently (as described above).
3) Insulin syringes will normally have a fine needle already attached. Remove the syringe from its packet and remove the cap from the needle (and the clear cap from the back of the plunger - if present).
4) Fill the syringe with air by drawing back the plunger to the required dose. (Read the scale on the syringe level with the top of the black rubber on the plunger - the side closest to the needle). Insert the needle through the centre of the rubber stopper on the insulin bottle and inject all the air into the bottle.
   (This prevents a vacuum from being created inside the insulin bottle, which would eventually make it hard to withdraw the insulin dose). Please note: This technique applies to insulin in 10ml glass phials. If you have been provided insulin in 3ml "pen-fill phials" then do not inject air into the phial.
5) Turn the insulin phial upside down and make sure the needle tip is below the surface of the liquid.
6) Withdraw more than the required dose of insulin. Check for air bubbles in the syringe. If present, gently tap or flick the syringe with your finger until they rise to the top. Push the plunger in until the air bubbles disappear and stop when you reach the required dose.
   The dose will be measured in *units* (or *iu* for *international units*). Your syringes should match the concentration of insulin you are using, which is usually 100units/ml.
   Always get your syringes from your regular vet.
7) If there are still air bubbles in the syringe, squirt the insulin back into the bottle and repeat step 6 until you have the correct dose of insulin with no bubbles. (If there are bubbles in the syringe then your pet won't get their full insulin dose).

Tip: There will usually be one member of the family who is responsible for giving the injections, but it is wise to have someone else trained in the procedure too in case you are unavailable.

Injecting your pet:

1) Hold the syringe in your right hand (reverse these instructions if you are left-handed). There are many different ways to hold a syringe, but we suggest you try a pencil grip for starters.
2) 'Tent' the skin by picking up a fold of skin from somewhere on your dog's abdomen with your left hand. Choose a slightly different spot each day.
   You may find it easier to learn by injecting in the loose skin on the back of the neck. But absorption of the insulin is more consistent on the sides of the abdomen.
3) Hold the syringe at an angle to the skin and quickly push the thin, sharp needle through your pet's skin at the base of the skin-fold.
   It is *not* recommended to swab the skin with alcohol.
   The needle should go through the skin easily and almost painlessly. Occasionally you may hit a small nerve under the skin and your pet will flinch or yelp, but in most cases they will show no reaction to the needle at all.
   The needle is only about 1cm long, but still you should be careful to push it through only one layer of skin, not out the other side (possibly into your finger!). This would result in injecting the insulin onto your pet's hair.
4) To inject the insulin, place your thumb or forefinger on the plunger and push it all the way in. Then withdraw the needle from the skin. Stroke your pet and praise them for sitting quietly.
   Feel the skin and make sure it is not wet (which would indicate that you had injected the insulin onto the hair!)
5) Carefully replace the cap on the needle, and store the insulin *and the used syringe* back in the fridge.
   Ideally, insulin syringes should be used only once, but using the same syringe many times for your pet doesn't seem to cause any problems. Just be sure to keep it clean, cap it carefully (without blunting it) and store it in the fridge (out of reach of children). Use a new syringe every few days, or when starting a new bottle of insulin.
   Discard used syringes responsibly. Put them into a hard plastic bottle or use an approved sharps container. You can bring them back to us for disposal.

Monitoring

Your pet's progress must be checked on a regular basis. Monitoring is a joint process that the pet owner and vet must work on together.

Home Monitoring:

Home monitoring requires a consistent awareness of your pet's appetite, thirst and urine output. Bodyweight should be checked weekly. Any significant change in these 4 factors could indicate poor control, and requires reassessment by your vet.

Other methods of home monitoring include urine testing or home blood glucose testing. This can be done using test strips designed for human diabetics. They can be bought from the chemist or we can supply them for you.
Home urine testing is not essential, but it can provide better monitoring (see *Home Urine Testing*).
Home blood testing is not often used in pets, but it does provide the optimum level of monitoring. See *Home Blood Glucose Testing* for more information.

Vet Monitoring:

Initially, your pet will require regular visits back to the vet while his/her condition is being stabilised. This is likely to be once or twice a week for the first few weeks, every 2-3 weeks for another few months and then every 3-4 months after that. This will vary according to your pet's response to treatment, and how quickly their condition stabilises. Vet visits should also occur any time that the symptoms of diabetes recur, after a "hypo" or if significant amounts of glucose are found in the urine for a few days in a row (see *Home Urine Testing*).

Blood glucose tests will be performed at each visit, and we will ask you about your pet's appetite, thirst and activity level, and check for any change in body weight. This information will help us to adjust the insulin dose (and diet) to your pet's individual needs.

A normal blood glucose test only tells us the level at the moment the test was taken, and can sometimes vary dramatically from hour to hour (*see Blood Glucose Levels* later for more details). Ideally we want to know the highest and the lowest blood glucose levels for the day. The lowest level is the most important, so we will normally ask you bring your pet in approximately 5-6 hours after their morning insulin injection. This is when the blood glucose level is likely to be at its lowest.

Blood samples will be sent to the lab occasionally for a fructosamine test. These give us an indication of the average blood glucose level over the preceding 2-3 weeks, and along with a blood glucose test, will give us the best indication of blood glucose control (see *Blood Fructosamine Tests* later for more details). If your pet is difficult to stabilise, we may advise a day in hospital and measure the blood glucose every 2 hours.

"Hypos"

Hypoglycaemia means "low blood sugar". An episode of low blood glucose is commonly called a **"hypo"**.

Without enough glucose in the blood to supply the cells of the brain, your pet may develop **symptoms** including tiredness, weakness, restlessness, twitching/trembling and unusual behaviour.

Hypos must be **treated** by feeding your pet immediately – preferably something sweet (with sugar or glucose). If your pet is unwilling (or unable) to eat, you can rub something sweet on their gums. A syrup can be made by mixing a teaspoon of sugar or glucose powder with a little bit of water, or you can use honey. This should see them getting back to normal again within 15-20 minutes. As soon as your pet is looking better, give them something else to eat, and keep an eye on them for a few hours. Whenever a hypo occurs, make a record in your calendar or diary. Contact us (in business hours), as reassessment of the insulin dose may be needed.

In more serious *hypos*, your pet may have seizures or lose consciousness. This is an **emergency** and requires immediate veterinary attention. Fortunately these serious *hypos* are very uncommon.

Hypos are more likely to occur:

- At the time of peak insulin action, 4-8 hours after the insulin injection.
- If your pet eats less than usual.
- After a period of increased exercise or activity.
- If too much insulin is given (by inaccurate measurement of the dose, poor mixing of the insulin, or accidentally giving 2 doses).
- If your pet's insulin requirements have changed. This may, for example, happen if your pet loses weight. We reassess your pet every 3-4 months to monitor changes in insulin requirements.

Unfortunately, it is impossible for your diabetic pet's blood glucose level to ever be as well controlled with insulin injections as it would normally be controlled by a healthy pancreas (see *Blood Glucose Levels*). Low blood glucose is more critical than slightly high blood glucose, so wherever possible, we will adjust your pet's insulin dose with the aim to keep the blood glucose level in the range of 6-10mmol/L (slightly above normal range). However it is likely that sometimes the blood glucose level will move outside of this target range. Short periods of moderately high blood glucose will cause no major problems for your pet. However, low blood glucose is a more serious problem.

Exercise

Regular exercise is an important part of diabetic management. It will help to keep your pet fit, prevent obesity and reduce insulin requirements. However it needs to be regular - daily if possible. Diabetic control relies on maintaining the balance between energy intake (food), energy use (exercise) and the insulin dose. Large changes in exercise from day to day will upset this balance. Unusually strenuous activity can lower blood glucose and risk the occurrence of a *hypo*. If your pet is going to be doing extra exercise, then the morning insulin dose should be reduced by one-third, and some extra food should be given just before the exercise.

Females should be desexed

If you have a bitch who has not been spayed, then this should be done as soon as possible. Female sex hormones interfere with the actions of insulin, resulting in dramatic fluctuations in insulin requirements. Pregnancy creates even more complications.

Important!

Please read the **Summary of Instructions**

at the end of this brochure.

The information included in the following section is not all essential for the treatment of your diabetic pet. However, it will help by giving you a better understanding of the disease, and answer some of the other questions you may have.

Further information - Diabetes

What does insulin (or lack of insulin) do?

We've said that diabetes occurs because of a deficiency of the hormone insulin, and insulin injections are a vital part of the treatment of most diabetics.

But what is insulin and what does it actually do?

Insulin is produced by beta islet cells in the pancreas - a small organ located near the stomach. Insulin has many roles in the body - the most important of which is to regulate blood sugar (glucose).

Insulin acts as a key, opening doors in the walls of our cells and allowing glucose in. Glucose is the essential energy source for our body's cells. Without insulin, the glucose builds up in the bloodstream, and the cells are starved of energy. As a result of this cellular starvation, the body starts breaking down its stores of body fat and protein as an alternative energy source. Your pet will eat more because its cells are starving, yet will actually lose weight. The excess glucose that builds up in the bloodstream will cause damage to a number of body organs. The body will eliminate some of this excess glucose via the urine. However, the glucose takes a lot of water with it, so your pet will urinate more. To avoid dehydration, they will drink more water.
Thus we have the four classical signs of diabetes:
weight loss, increased appetite, increased thirst and increased urination.

What causes diabetes?

Diabetes occurs when the body is unable to produce enough insulin to control blood glucose levels. Either there is decreased insulin production or other factors may be increasing the body's demand for insulin. As to why this occurs, there is no simple answer!

- In dogs, diabetes is usually caused when the immune system destroys the beta cells in the pancreas. This could be triggered by a viral infection in some cases.
- In cats, diabetes is often the result of excess insulin demand. The beta cells become exhausted and die.
- Obesity (being overweight) greatly increases the body's demands for insulin, and is one of the biggest risk factors for developing diabetes.
- Genetics plays a role too, and some breeds are more likely to develop diabetes than others. Female dogs and male cats are more frequently affected.
- Pancreatitis will occasionally cause permanent damage to the beta cells in the pancreas.
- Some drugs will increase the risk of developing diabetes, particularly some reproductive hormones.
- Multiple factors may be involved when a dog or cat develops diabetes.
- If caused by obesity or drug treatment, then diabetes can sometimes be cured. But in most cases, regardless of the cause, lifelong treatment is needed.

Blood Glucose Levels

In the normal body (one without diabetes), blood glucose levels are closely controlled by regulated release of insulin from the beta cells in the pancreas. A constant low basal level of insulin is released all the time. Then, after eating, an extra bolus of insulin is released to process the glucose absorbed from the food. Unfortunately, twice-daily insulin injections can't match this ideal. We inject long-acting insulin, and try to time feeding to match the times when the insulin is having its maximal effect. Despite these best attempts, blood glucose levels are likely to fluctuate throughout the day, even in a well-controlled diabetic patient. We adjust your pet's insulin dose with the aim to keep the blood glucose level in the range of 6-10mmol/L (slightly above normal range) to minimise the risk of *hypos*.
One difficulty we face is that when we measure your pet's blood glucose, we don't know what it was 2 hours earlier, or what it will be 2 hours later. It's not like your cholesterol level, which may take weeks or months to change significantly. Blood glucose can fluctuate hour by hour. *Blood fructosamine* measurement (see below) can help by giving us an idea of the average blood glucose level over the previous 2-3 weeks. It may also be necessary to admit your pet to hospital for a day and measure the blood glucose every 2 hours to identify the time of peak insulin effect.

Home Urine Testing

One way to monitor your pet's control is to test the urine for the presence of glucose. This is not as good as direct measurement of blood glucose (see below) but it is easier. Glucose spills into the urine only when the blood glucose is quite high (typically above 13mmol/L). With good control, the urine should have little or no glucose in it. However, urine testing provides no way to tell if the blood glucose is low - only if it is high.

Urine can be caught in a shallow dish when your dog goes to the toilet. Only a small amount of urine is needed. In cats, urine collection usually involves the use of a clean litter tray and non-absorbent litter material (such as clean aquarium gravel, shredded plastic bags or clean needle caps). We can help with further advice on urine collection if necessary.

Urine test strips can be bought from any chemist (eg. *Keto-Diastix* which measure both glucose and ketones in the urine), or we can supply them if required. You simply dip the test strip in the urine, shake off excess urine and read against the colour chart on the bottle. Or, you can bring a fresh urine sample in to us for testing.

Urine should normally be tested once or twice a week. The best time to collect a sample is just before the morning or evening insulin injection. If more than a trace amount of glucose is found in the urine, then the test should be repeated daily for a few days. If glucose is found in the urine for 3 days in a row, or if ketones are found in the urine at any time, your pet should be re-assessed by your vet. You should **never** make changes to the insulin dose yourself based on home urine testing.

Home Blood Glucose Testing

Measuring the blood glucose level (BGL) is the most accurate way of monitoring diabetic control. For various reasons, few pet owners use this technique. However, human finger-pricking devices and blood glucose meters can be used, and many of these are quite inexpensive. The web site *www.petdiabetes.org* includes useful information on home blood glucose testing, and we are happy to help anyone who is willing to learn to do this.

Ideally, we want to know the highest and lowest blood glucose levels during the day. The most important times to measure the blood glucose are therefore just before the insulin injection (when glucose is likely to be the highest), and at the time of peak insulin action, about 6 hours after the insulin injection (when blood glucose is likely to be the lowest).

Blood Fructosamine Testing

Fructosamine is a blood test that can be performed by a laboratory to determine the average blood glucose level over a period of time. This is useful because a normal blood glucose test will only indicate the glucose level at one moment in time. Fructosamine forms when glucose binds irreversibly to protein in the blood. Once formed, fructosamine remains in the bloodstream for 2-3 weeks. Fructosamine therefore gives an indication of the "average" blood glucose over the preceding 2-3 weeks.

A similar test known as *glycosylated haemoglobin (HbA1c)* is used in human diabetics, and measures the binding of glucose to haemoglobin in the bloodstream. This test gives a measure of the average blood glucose period over the preceding 3 months, but is not readily available at our veterinary laboratories.

Can diabetes be managed with tablets?

In human Type 2 diabetes, tablets sometimes work by stimulating the surviving beta cells in the pancreas to work harder and produce more insulin. In dogs, ALL beta cells have usually been destroyed by the immune system – so tablets won't work! In some cats, tablets can work for a while, but they will hasten the death of the remaining beta cells. Not only do these cats then need insulin injections, but also their diabetes is more difficult to manage in the long-term. We don't advise tablets for the management of diabetes in dogs or cats.

Can diabetes be managed with diet alone?

In diabetic dogs, the pancreas is usually unable to produce ANY insulin, so diet therapy alone won't work.

Most cats will require life-long insulin treatment too. However, some cats may be managed with diet alone (or can go into remission and need no treatment at all), IF the factors creating insulin resistance are removed.

ALL cats should be started on insulin treatment when diabetes is first diagnosed. This helps to stabilise the patient, and spares the remaining beta cells in the pancreas from exhaustion and death. Once blood glucose levels are stable, obesity has been corrected and any other illnesses have been treated, some cats can be weaned off insulin. With a low-carbohydrate, high-protein diet (such as *Hill's Prescription Diet m/d*), some diabetic cats may be managed with diet alone.

Can my pet be treated with once daily insulin?

This does not provide good control. With a larger dose of insulin given once daily, there is going to be more variation in the blood glucose level throughout the day, with persistent symptoms of diabetes and greater risk of *hypos*. We do not advise once daily insulin injections.

What happens if I miss an insulin dose?

If you remember within 2-3 hours, give the normal dose. Any later than this and you should ask us for advice.

If you forget completely, don't panic. The blood glucose will rise (possibly over 20mmol/L); your pet may become very thirsty and feel unwell. It should be a high priority for you not to miss any insulin injections. But missing an occasional injection is not a crisis. Things should start to get back to normal again when you give the next dose. The more often you miss injections, the poorer your pets overall health will be, and the greater will be the chances of complications. Missing a few injections in a row can make your pet extremely sick! Never allow yourself to run out of insulin!

What if I can't remember if I gave the injection?

Don't give another dose. It's better to miss a dose than to risk double-dosing. Similarly, if you accidentally inject some of the insulin through both layers of skin and into the hair, don't repeat the dose (as your pet may have got some of the first dose). Just learn from your mistake and try not to do it again!

What happens when I go out or go on holidays?

It is very important that you have someone responsible care for your pet. Your pet needs to get their injections and regular meals as usual. A good boarding kennel should have someone who is able to give insulin injections if needed. If your pet frets when you are away, this may complicate things, particularly if they go off their food. Make sure that you make arrangements for veterinary care if needed while you are away – and leave a phone number where you can be reached.

What happens when my pet is sick or won't eat?

Your pet needs their insulin injection, even when they are sick. Missing an injection is likely to make your pet sicker. However, we advise giving only half of the normal dose if your pet refuses to eat. You should seek veterinary attention if your diabetic pet is sick and off food for any more than one day.

Some pets are fussy eaters, and won't eat consistently even when they are well. These fussy patients create a challenge! In these cases, it may be best to offer food just before the injection, and only give the full insulin dose once you can see that your pet is eating. It may also be necessary to use an alternative long-acting type of insulin (see below).

Is diabetes in pets the same as in people?

In the simplest terms, yes, the diseases are very similar. However, there are important differences, both in the development of the disease and its treatment:

- In humans, there are 2 types of diabetes – creatively named Type 1 and Type 2! This division is not usually made in dogs and cats.
  Human Type 1 diabetes (previously called "Insulin-dependent diabetes") usually develops in children, and results from complete destruction of the beta cells in the pancreas. It requires treatment with insulin injections. It is very similar to the diabetes that we see in dogs (of all ages) and many cats.
  Human Type 2 diabetes is more common and usually develops in adults. It is often the result of increased insulin demand (and/or decreased insulin production). Type 2 diabetes in people might be managed with diet alone, with tablets, or with insulin. Insulin is almost always required to manage diabetes in dogs and cats.
- Human diabetics are advised to measure their blood glucose frequently, and often give four or more insulin injections per day. This management (though ideal) is impractical for most pet owners, so simpler treatment programs are used in pets.

Insulin Types

There are dozens of different types of insulin on the market. Most of these are synthetically produced in a laboratory for human use. They vary in their time of onset, time of peak activity and duration of action.

	Times vary dramatically between animals. These figures are only an approximate guide.		
Insulin Name/Type	**Onset of Activity**	**Time of Peak Action**	**Duration of Action**
Actrapid *(regular)*	30 min	2-5 hrs	4-10 hrs
Humalog *(Lispro)*	Immediate	1-2 hrs	3-5 hrs
Monotard *(lente)*	2 hrs	4-8 hrs	8-20 hrs
Caninsulin *(lente)*	1-2 hrs	3-12hrs	8-24 hrs
PZI	1-4 hrs	8-20hrs	8-30 hrs
Protophane *(NPH)*	0.5-3 hrs	4-16 hrs	8-24 hrs
Mixtard *(mixed)*	30 min	2-12 hrs	8-24 hrs
Lantus *(glargine)*	very slow	n/a	12-24 hrs

The insulin we most commonly use in diabetic pets is ***Caninsulin***, which is manufactured especially for dogs and cats. (One thing to watch with Caninsulin is that it has a concentration of only 40units/ml, and you should use special matching U-40 insulin syringes.) Caninsulin can be expensive in large dogs where large doses are required. In these situations, we may use a human insulin such as Protophane or Mixtard. Lantus is a new long-acting synthetic insulin also known as *insulin glargine.* Initial research shows this to be a good insulin for cats, especially when combined with feeding *Hill's Prescription Diet Feline m/d.*

As your vet, we will select an appropriate insulin for your pet. The type of insulin used should never be changed unless we advise you to change because of poor control with your existing insulin.

Diabetic Ketoacidosis

Diabetic Ketoacidosis is a serious complication of undiagnosed or poorly controlled diabetes. Due to lack of insulin, the body will break down muscle and fat in an attempt to meet its energy needs. This eventually causes toxic metabolites (ketone bodies) to build up in the blood stream. Your pet will feel very ill. Symptoms can eventually include loss of appetite, nausea, vomiting and weakness. If left untreated, your pet can lapse into a diabetic coma and die. Ketoacidosis may be present at the time of diagnosis if your pet's diabetes was not recognised in the early stages. Once diabetic treatment has started, the chances of ketoacidosis are negligible, unless control is very poor or there is a treatment lapse.

Ketoacidosis requires intensive treatment in hospital, including intravenous (IV) fluid therapy, IV insulin, and regular blood tests and monitoring. It will add considerably to the cost of diabetic stabilisation and treatment.

Are there any other types of diabetes?

There is another rare disease called *diabetes insipidus.* This is totally unrelated to *diabetes mellitus* (the subject of this brochure). *Diabetes insipidus* has excessive thirst and urination as its primary symptoms. But this is the only similarity to *diabetes mellitus.* The causes, diagnosis and treatment are completely different.

Is there any hope for a cure?

There is always hope, but sadly we are unlikely to see a cure for diabetes in your pet's lifetime. A lot of research is being done on diabetes though – both in pets and humans. This includes work on prevention, better treatments and ultimately, maybe a cure. The recent advent of *Lantus insulin* and *Hill's Prescription Diet Feline m/d* have already made significant advances in the treatment of diabetes in cats.

More information:

Because diabetes in dogs and cats is similar to human Type 1 diabetes, there is a huge amount of information available about diabetes – including books and web sites. We warn you however, never to make any changes to your pet's treatment without first discussing it with us.

- *Pets with Diabetes* web site: www.petdiabetes.org
- *Diabetes Australia* produces many books on diabetes (in people): www.diabetesaustralia.com.au
- *Diabetes Australia NSW:* www.diabetesnsw.com.au

Diabetes - Summary of Instructions

- Read this brochure and understand the basics of diabetic management.
- Give injections of _____ units of _____ insulin, at _____ AM and _____ PM every day.
- Feed your pet approximately 1 – 1½ hours after the insulin injection.

  Give the same amount of the same food at the same time every day.
- Do not feed treats or titbits
- Always provide plenty of fresh water.
- Make sure that you know how to recognise and treat the symptoms of *hypoglycaemia.*
- Never run out of insulin or syringes! Order another bottle well before your current one runs out.
- Come back for your next appointment at: _____ AM/PM on _____

  Give the insulin and feed as normal on this day.
- Signs of problems you should look for include:
  - increased thirst
  - increased urination
  - changes in appetite
  - weight loss (or gain)
  - lethargy or lack of energy
- If you have any concerns or questions, please phone and speak to a member of our staff.