

## BASIC INFORMATION

### Description

Diabetes mellitus (DM) is also known as sugar diabetes because of the increased blood and urine sugar levels that occur with this disease. DM arises when the pancreas gland does not produce enough insulin. Insulin is the hormone that allows many tissues of the body to utilize blood sugar (glucose). As insulin levels falls, blood sugar becomes elevated, producing many adverse side effects in the body.

### Causes

The most common cause of DM in the dog is the destruction of beta cells in the pancreas. Beta cells are responsible for insulin production. This destruction often arises from chronic inflammation of the pancreas gland. This type of diabetes is known as type I DM.

In the keeshond breed, type I DM is an autosomal recessive trait in which one abnormal gene is inherited from each parent.

Type II DM, which arises either from the development of resistance to insulin or from a decreased action of insulin within the body, is rare in dogs.

### Clinical Signs

- The miniature schnauzer, miniature poodle, toy poodle, Samoyed, and pug are at increased risk. The usual age at onset is 7-9 years. Females develop DM more often than males.
- Common clinical signs include increased thirst and urination, increased appetite, and weight loss. Because glucose cannot be utilized by the body, weight loss occurs even with more food intake.
- Some dogs may develop cataracts very suddenly and go blind.
- A severe form of complicated DM called *diabetic ketoacidosis* may cause the animal to become terribly ill, with vomiting, depression, weakness, dehydration, and rapid breathing.

### Diagnostic Tests

DM is diagnosed when the fasting blood sugar concentration is significantly elevated. A urinalysis may also show sugar (glucose) and ketones in the urine.

Additional tests are often indicated to look for other diseases (such as urinary tract infection or inflammation of the pancreas) that may accompany DM. Such tests include a complete blood count, biochemistry profile, urinalysis, urine culture, abdominal x-rays, etc. If Cushing's disease (overactivity of the adrenal glands) is also suspected, hormonal tests may be performed.

## TREATMENT AND FOLLOW-UP

### Treatment Options

Most dogs with DM require injectable insulin to control their disease. Insulin comes in three forms: short-acting (regular insulin—*Humulin R*, *Novolin R*), intermediate-acting (NPH or PZI—*Humulin N*, *Novolin N*, *Vetsulin*, *Caninsulin*, *PZI Vet*), and long-acting (glargine—*Lantus*). Regular insulin is used most often for diabetic ketoacidosis. Twice-daily injections are needed by most dogs, even when the longer-acting insulins are given.

In addition to insulin, the diet may be changed to a low-fat, high-fiber type of food that contains complex carbohydrates. Several such foods are available by prescription through your veterinarian. Exercise and activity levels are often regulated so that they do not fluctuate widely from day to day.

Dogs with diabetes ketoacidosis usually require hospitalization with administration of intravenous fluids, multiple injections of regular insulin, and frequent monitoring of blood sugar.

Because other hormones effect DM, intact female dogs should be spayed, and other hormonal abnormalities (Cushing's disease, hypothyroidism) should be corrected. Dogs with cataracts must have their DM well regulated prior to surgery.

### Follow-up Care

Monitoring is extremely important to keep the blood sugar within the desired range. Too much insulin or too little food intake (poor appetite, vomiting) may result in hypoglycemia (low blood sugar). Too little insulin results in persistently high blood sugar that may lead to ketoacidosis.

Home monitoring often involves keeping track of water intake and the frequency of urinations, checking urine for sugar and ketones, using a glucometer and pricking the skin or the ear to measure blood sugar, and monitoring appetite and food intake.

In-clinic monitoring involves checking blood sugar, possibly as a glucose curve. A glucose curve is produced by measuring blood sugar several times over the course of the day, after insulin is administered and the dog is fed as usual. Other laboratory tests may be repeated to ensure that the complications of DM are resolving.

Sometimes glucose curves can be obtained at home with the use of a glucometer or a continuous, subcutaneous device.

Based on test results, the dose of insulin is adjusted. It is increased when blood sugar is high and decreased when blood sugar is low.

### Prognosis

DM can be challenging to regulate and may require patience and persistence, but it can be successfully managed in most dogs. It is necessary for owners to educate themselves about the disease and to remain in close contact with our veterinarians. Most dogs readily accept the injections and the necessary monitoring.