

Diabetes in Dogs - Testing and Monitoring

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Diagnosis

What tests are suggested for the diagnosis of diabetes mellitus in dogs?

Generally, the following screening tests are performed when diabetes mellitus is suspected: a complete blood count (CBC), a serum biochemistry profile, and a urinalysis.

Why so many tests? Can't diabetes be diagnosed by an elevated blood sugar value alone?

Elevated fasting blood and urine glucose (sugar) values are absolutely essential for the diagnosis of diabetes mellitus, but other screening tests provide additional information regarding the severity of the diabetes, any conditions that may be contributing to the diabetes, and any complications related to the diabetic state.

Because diabetes mellitus is usually diagnosed in middle-aged to older dogs, your dog may have other unrelated conditions that need to be managed along with diabetes. The screening tests will usually alert us to any such conditions.



What might a CBC reveal if my dog has diabetes mellitus?

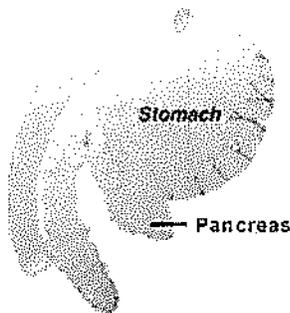
The complete blood count (CBC) evaluates the red blood cells, the white blood cells, and the platelet components of a blood sample.

With uncomplicated diabetes mellitus, these components are often within the normal range. However, changes may occasionally be seen in the red or white cell values.

Despite drinking large quantities of water, diabetic dogs lose body water because they produce such dilute urine. Therefore, your dog may actually be dehydrated. Dehydration can be indicated on the CBC by increases in the packed cell volume (PCV - the proportion of the blood volume that is actually occupied by red blood cells) as well as increases in the total red blood cell count.

In some severe diabetic states, lysis (rupture) of red blood cells within the blood stream may occur because of the loss of electrolytes, resulting in reduced PCV and red blood cell numbers. Infections, particularly urinary tract infections, are common in diabetic patients. Increased numbers of white blood cells typically indicate the

presence of infection.



What might the serum biochemistry profile indicate if my dog has diabetes mellitus?

An elevated serum glucose (blood sugar) concentration is vital to the diagnosis of diabetes mellitus. The stress of a veterinary office visit or the mild restraint associated with obtaining a blood sample may significantly increase your dog's serum glucose value. Blood glucose will also be mildly elevated for several hours following a meal. Therefore, confirmation of diabetes may require more than one blood sample collected over a period of several days.

Occasionally we will see changes in serum electrolytes. Electrolytes are the mineral components of serum and include sodium, chloride, and potassium. They are involved in many of the body's daily functions, such as nerve conduction and maintenance of proper hydration. Because of the large volume of dilute urine that diabetic dogs produce, excessive amounts of electrolytes may be lost in the urine. Such losses can result in rare but serious complications. For example, severe deficits in phosphorus may result in ruptured red blood cells within the blood stream.

The liver-related enzymes ALT (alanine aminotransferase) and AST (aspartate transaminase) may be increased mildly in diabetic dogs and may reflect mild liver cell damage related to decreased blood flow from dehydration.

What might a urinalysis indicate if my dog has diabetes mellitus?

A urinalysis is necessary for the diagnosis of canine diabetes mellitus. Urine from healthy dogs typically does not contain any glucose (sugar).

Glucose in the urine (called glucosuria), as well as persistently increased blood glucose levels (called hyperglycemia), in a dog with appropriate clinical signs is diagnostic for diabetes mellitus.

The presence of glucose in the urine makes conditions ideal for bacterial growth, so urinary tract infections are common. Urine is evaluated for the presence of red blood cells, white blood cells, and bacteria. If a bacterial infection is identified or suspected, a urine culture is indicated to identify the types of bacteria and determine the most appropriate antibiotics to treat the infection.

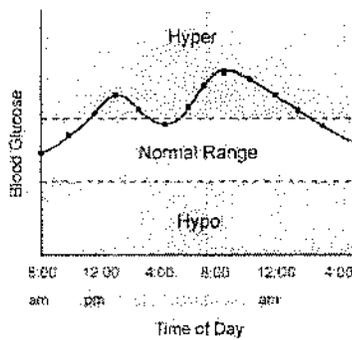
The presence or absence of ketones in the urine should be evaluated in diabetic dogs. Ketones are byproducts of fat metabolism. Increased mobilization of fat occurs in diabetic dogs because their insulin deficiency causes poor use of carbohydrates as an energy source. Depending upon your dog's clinical signs, the presence of ketones in the urine may indicate a more severe or long-standing case of diabetes mellitus.



Once my dog has been started on insulin therapy, what monitoring tests will be necessary?

When insulin therapy is first started, monitoring your dog's response to therapy by periodic blood glucose determinations is important. Ideally, this involves serial blood or serum glucose determinations in the form of a glucose curve. Because of the nature of most dogs, hospitalization and serial blood sampling, no matter how gentle, may result in stress-related increases in blood glucose that will confound the results of a glucose curve. New technology has allowed the adoption of home glucose monitoring with the use of a simple device. Additional home monitoring can involve the evaluation of urine for the presence of glucose, although this is not a very sensitive way to monitor glucose levels.

At home, other important things you can do for your dog include monitoring his appetite, water consumption, energy level, and urine output. Any changes may signify the need for additional testing and/or adjustments in the insulin



dosage. It is very important that you do not make adjustments in the insulin dosage without first consulting your veterinarian!

At the beginning of insulin therapy, more frequent (daily) monitoring of blood glucose (with or without testing urine glucose) is indicated. Either very high or very low glucose levels indicate the need for adjustments in insulin dosage with the guidance of your veterinarian.

Once your dog's optimal insulin dosage has been determined and his diabetes is well regulated, monitoring may involve 'spot checks' of urine for the presence of glucose.

"Serum fructosamine level is a reliable and easy way to evaluate your dog's response."

Serum fructosamine level is a reliable and easy way to evaluate your dog's response to insulin therapy. Fructosamine forms through the binding of glucose to proteins in your dog's blood stream. The higher the blood glucose, the greater the amount of fructosamine formed. Similarly, the lower the blood glucose, the smaller the amount of fructosamine formed. Fructosamine is measured from a single blood sample. No special preparation (e.g. fasting) is required. Serum fructosamine provides a retrospective view of the average blood glucose concentration that your dog has achieved over the past 2 to 3 weeks. Therefore, it is extremely helpful in long-term monitoring of diabetic dogs.

Recent changes in blood glucose concentrations are not detected by serum fructosamine levels. Therefore, if your dog is showing any behavioral changes that might signal a new insulin requirement, then direct blood glucose levels are more appropriate.

This client information sheet is based on material written by: Kristiina Ruotsalo, DVM, DVSc, Dip ACVP, Margo S. Tant BSc, DVM, DVSc, & Robin Downing, DVM, DAAPM, DACVSMR, CVPP

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