Urinalysis: Testing a Urine Sample

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There are many valuable pieces of information that your veterinarian can obtain from analyzing a urine sample. As with any other procedure, it is important to remember that we need to look at the whole picture, not just one value, before we attempt to draw any conclusions from the testing. Test results always need to be interpreted in light of the history, physical exam, possible blood work, and further testing such as x-rays, ultrasound, etc.

Obtaining a urine sample

There are several different ways to obtain a urine sample from a pet. The most common way to catch a sample in a larger pet, such as a dog, is to use a clean, dry container, such as an aluminum pie pan, plastic dish, etc. A litter box can be washed, rinsed well to eliminate all traces of detergent or disinfectant, and allowed to dry. Then use special litter available from your veterinarian, or clean styrofoam packing peanuts instead of regular litter. After the pet has urinated, the styrofoam is removed and the sample is poured into a clean container.

To minimize changes in the urine, always collect the urine sample in a clean, dry container, and take it to your veterinarian's office immediately. If there will be a wait, refrigerate the sample. If the temperature is warm, consider placing the urine in a cooler during transportation. DO NOT FREEZE A URINE SAMPLE.

If a sterile sample is needed, your veterinarian may recommend that you bring your animal to the veterinary clinic for a procedure called "cystocentesis," in which a small needle is placed directly into the bladder through the body wall. This procedure does not take very long, and should provide a sample that has not been contaminated by debris or bacteria from outside the bladder. Your veterinarian may also use a urinary catheter to obtain a urine sample.

Analyzing the urine sample

A complete urinalysis usually involves 3 steps:

1. Checking and recording the color, turbidity (cloudiness), and specific gravity (a measure of how concentrated the urine is) of the sample.
2. Performing a chemical analysis using a multi-test dipstick.
3. Centrifuging a small portion of the sample and examining the sediment (heavier particles) under a microscope.

Color/turbidity/specific gravity: Normal urine is amber-yellow in color and clear to slightly cloudy. Concentrated urine is a darker yellow. Dilute urine may be colorless. White blood cells may make the urine cloudy. Blood in the urine can give a red-brown tinge.

To determine the specific gravity, a drop of urine is placed into an instrument called a "refractometer." In simplest terms, specific gravity indicates how well the kidneys are able to concentrate the urine.

Normal Specific Gravity

Dogs: 1.015 to 1.040

Cats: 1.015 to 1.050

Chemical analysis: Many chemical tests can be performed on a small quantity of urine by using a dipstick. A dipstick is a piece of plastic to which pads of certain chemical reagents have been attached. Each pad will test for a particular substance in the urine. When the urine comes in contact with the reagents, a chemical reaction occurs which changes the color of the pad based upon how much of the substance is in the urine. The color of the pad is compared to a color chart and an approximate amount of the substance can be determined. There are several brands and types of dipsticks. Some may measure only one or two substances, while others may measure 8 or more.

There are several medications that may interfere with these chemical tests and cause false results. Be sure to let your veterinarian know about any medications and/or supplements your animal is taking. If any of the values on the urinalysis are significantly higher or lower than normal, your veterinarian may suggest waiting several days to several weeks and then checking another sample to see if the abnormality is still present. The following substances are just a few of the chemicals tested during a routine urinalysis:

- Urine pH – This number is a reading of how acidic or alkaline the urine is. On a pH scale of 1-14, 7 is considered neutral, meaning neither acid nor alkaline. A number less than 7 indicates acidity, while a number greater than 7 indicates alkalinity. It is the pH (acidity or alkalinity) of the pet's urine that is being measured in a urinalysis, not the pH of the food the patient has eaten, or the pH of the patient's blood.

  Most normal dogs and cats have a urine pH of 5.5 to 7.0; however, some normal pets may have higher or lower

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values.

- Protein – Healthy animals will usually not have any protein in their urine, although in some cases small, trace amounts may be normal. The significance of any protein in the urine is dependent upon the specific gravity of the sample. Small amounts of protein are more significant in dilute or unconcentrated urine.
- Glucose – If the glucose (sugar) in the blood is significantly higher than normal, (for example, in diabetes) some of the excess will be found in the urine. Normal dog and cat urine should be negative for glucose on a dipstick. There are several reasons why glucose in the urine may falsely appear elevated, so it is important that any suspicious test results be repeated, and followed (or verified) by a blood glucose test.
- Ketones – Ketones are substances formed in the body during the breakdown of lipids (fat). When excess amounts of ketones are formed, their level rises in the blood, and in turn, the urine. The condition of excess ketones in the urine is termed "ketonuria." Ketonuria may be found in cases of starvation, in some diabetic patients, and in certain other diseases. Normal pet urine should be negative for ketones.
- Bilirubin – Bilirubin is a pigment made by the liver from dead or dying red blood cells. Small amounts of bilirubin may sometimes be found in the urine of healthy dogs. Bilirubin in the urine of a cat is a concern and calls for further investigation. High amounts of bilirubin in the urine can be a sign of liver disease, bile duct obstruction, or abnormal destruction of red blood cells (hemolysis).
- Urobilinogen – This is a compound formed from bilirubin by intestinal bacteria. Normal cats and dogs have small amounts of urobilinogen in their urine. This is a common test that is included on many dipsticks, but the results are not considered very accurate in pets, and are difficult to interpret.
- Blood – Healthy pets may have a few red blood cells in their urine, but greater than normal amounts indicate a problem. Blood in the urine (hematuria) can be due to a number of causes, including trauma, urinary tract infection, bladder stones, and blood clotting problems.
- Nitrites – Nitrites may be produced by the bacteria present in some infections. However, this test often shows false negative results, and is considered inaccurate in pets.

Examining the sediment: After a urine sample is centrifuged, the top liquid portion is poured off, and the heavier particles in the bottom of the centrifuge tube are placed on a glass slide. Often, a drop of stain is added. The slide is then examined under the microscope for several different elements.

- White blood cells – Urine sediment should be examined for the presence of white blood cells. Larger than normal numbers of white blood cells may indicate inflammation from a bladder or kidney infection. Bladder stones can also cause inflammation. However, white blood cells can also enter the urine from the prepuce or vagina during sample collection.
- Bacteria – Urine sediment should be examined for the presence of bacteria. Small amounts of bacteria in a urine sample may be from contamination during sample collection. Large amounts of bacteria usually indicate a bladder infection, especially if an uncontaminated sample was obtained via cystocentesis. Performing an additional test called a urine "culture and sensitivity" will give information about the type of bacteria that are present and which antibiotics would be effective in treatment.
- Crystals – Microscopic crystals, made up of minerals, can sometimes be found in the urine. The most common types of crystals include struvite (ammonium magnesium phosphate), calcium oxalate, and ammonium urate. Under certain conditions crystals can clump together (precipitate) to form uroliths (bladder stones). Not all pets with crystals in their urine will necessarily form bladder stones. The type of crystal present, the pH of the urine, and other factors also play a part. Some animals appear to be more predisposed to crystal and/or bladder stone formation than others.
- Casts – Urine casts are small cylinder-shaped formations of cells and debris from inside the tubules of the kidneys. The presence of casts and their composition can give us more information about kidney function.

Summary

The urinalysis can provide us information not only about the kidneys and bladder, but the liver, pancreas, and other organs. In addition to helping us make a diagnosis, a urinalysis is also helpful in determining a prognosis (a forecast of the outcome of the disease) and response to treatment.

Still, as with other tests, the urinalysis is just a reflection of what is going on in the animal's body during a short period of time. In some instances, the results may be very different in a few days, or even in 24 hours. The veterinarian must always take into consideration everything that is affecting the animal and, in turn, how that may affect the test results.

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