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# Uranotest 11C

Reagent strip for veterinary  
urinalysis.

Only veterinary use

## Intended use

Urinalysis is an important tool in disease detection, as well as monitoring and screening animal health.

URANOTEST 11C is a reagent for urinalysis that determine the content of components in the urine by a quick and accurate way. The results can provide information on carbohydrate metabolism, renal and liver function, acid-base status and urinary tract infection.

Complete urinalysis involves both macroscopic and microscopic assessment and chemical evaluation. Strips are for single use only and they come ready to use, they also do not require additional laboratory equipment.

URANOTEST 11C urine strips are plastic strips that contain 11 separate test areas, each of them aimed at the determination of an analyte. URANOTEST 11C urine strips allows the semi-quantitative determination of the concentration of protein, glucose, ketones, bilirubin, nitrite, creatinine, blood and leukocytes. In addition, it also allows determining the pH and specific gravity. Strips are for single use only and they come ready to use, they also do not require additional laboratory equipment. The analysis is relatively cheap and completed in less than 2 minutes. The interpretation of the results can be made either by visual comparison of the test strip with the coloured blocks printed on the label or automatically using specific reader URANOTEST READER.

## Species

Dog and cat.

## Storage and Handling

Store in a cool, dry place at temperatures between 2 and 30°C. Do not store the strips in a refrigerator or freezer. Store away from moisture and light. When stored in the original container, the product is stable up to the expiry date printed on the label and (or) vial box. Replace the bottle cap immediately and tightly after removing test strips, and keep the vial tightly closed between tests. Do not remove desiccant from bottle. Do not touch test areas of urine reagent strips. Do not open container until ready to use. Discoloration or darkening of the test pads may indicate deterioration. If this is evident, or if test results are questionable or inconsistent with expected finding, confirm that the product is within its expiration date and is reacting properly using known negative and positive control materials. Do not use after the expiry date. Note once the canister has been opened, the remaining strips keep stable for up to 6 months.

## Specimen collection and preparation

Collect urine in a clean, dry container that allows complete immersion of all the fields on the test strip. Do not add preservatives. Test the specimen as soon as possible (ideally within 30 minutes after collection), with the sample well mixed but not centrifuged. If immediate testing is not possible, the sample should be stored in the refrigerator, but not frozen, and then brought to room temperature before used in the test. Unpreserved urine at room temperature may undergo pH changes due to microbial proliferation, which may interfere with protein determination. Skin cleansers containing chlorhexidine may affect protein test results if specimen contamination occurs.

## Test Procedure

The procedure must be followed exactly to achieve reliable results.

1 - Dip the strip into the urine up to the test area for no more than two seconds.

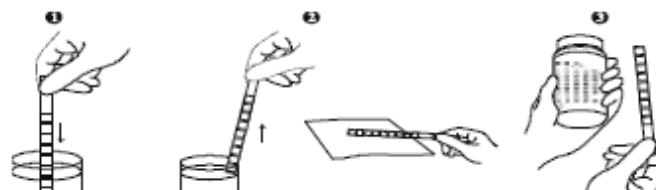
2 - Draw the edge of the strip along the brim of the vessel to remove excess urine; at this time, do not make the test areas touched to the brim of the vessel.

3 - Turn the strip on its side and tap once on a piece of absorbent material to remove any remaining urine. Excessive urine on the strip may cause the interaction of chemicals between adjacent reagent pads.

4 - Read the results

a. **If reading visually:** Compare the colours of the reagent pads exactly after 60 seconds with the colour chart on the vial label under good light. While comparing, keep the strip horizontally to prevent possible mixing of chemicals when excessive urine is present.

b. **If using the URANOTEST READER,** carefully follow the directions given in the instrument-operating manual. The instrument will automatically read each test pad result at a specified time.



## Interpretation of results

### UROBILINOGEN

Urobilinogen is formed by intestinal bacteria from the breakdown of conjugated bilirubin. Urobilinogen is usually excreted in feces, however a small amount may be reabsorbed and excreted in urine. The dipstick method measures urobilinogen by reacting with p-diethylaminobenzaldehyde in an acid environment. A positive test response indicates normal enterohepatic circulation of biliary pigments. High concentrations of biliary pigments may occur in hemolytic crisis, or cases of hepatic or intestinal dysfunction.

A false negative test result may occur if there is formalin residue in the collection container, or if the sample is old, because urobilinogen is very unstable when exposed to light and air.

### GLUCOSE

Glucose is not detectable in the urine of healthy dogs or cats. In a healthy animal, glucose passes freely through the glomerular filter and is resorbed by the proximal tubules. A concentration of 100 mg/dl may be considered abnormal if it is persistent. If glucosuria is present, it is due to either an excess amount of glucose reaching the tubules that cannot be resorbed or, less commonly, decreased tubular resorptive function. Reagent strip measures glucose levels using the glucose oxidase method. This method is a sequential enzymatic reaction. Glucose reacts with glucose oxidase to produce hydrogen peroxide, which oxidizes the indicator chemical to produce a color change. The color change is related to the amount of glucose present in the urine sample. Glucosuria may be either persistent or transient and multiple tests may be needed for differentiation of these conditions. Persistent causes of glucosuria include: diabetes mellitus, administration of glucose containing fluids, chronic disease that is not related to the kidneys such as hyperadrenocorticism, hyperpituitarism, or acromegaly. Other diseases that may result in transient hyperglycemias leading to glucosuria include: hyperthyroidism, acute pancreatitis, stress (especially in cats), postprandial, and administration of certain drugs. Rarely, a Fanconi-like syndrome may lead to glucosuria. Glucosuria should always be interpreted together with blood glucose levels.

False positive test results may be caused by contamination of the sample with oxidants such as hydrogen peroxide, bleach (sodium hypochlorite). False negative test results may be due to high concentrations of ascorbic acid (Vitamin C) in the urine. Moderately high concentrations of ketones also may cause false negative test results if the amount of glucose is only slightly elevated. The glucose test also becomes less reactive as urine specific gravity increases or as temperature decreases. Cold urine (refrigerated specimens) or expired reagent strips may also result in false negative test results.

### BILIRUBIN

In normal conditions, bilirubine is not detectable in the urine, therefore, even a low concentration of bilirubin detection is enough abnormal and require further investigation. Bilirubin is a powerful marker of liver disease. Bilirubin is produced from the breakdown of hemoglobin, transported to the liver bound to albumin, and conjugated with carbohydrates by hepatocytes. Only conjugated bilirubin is found in urine. Excess bilirubin may be produced when red blood cells are destroyed, or in liver disease, including bile duct obstruction. Conjugated bilirubin is detected in urine if the renal threshold is exceeded. The renal threshold in dogs, especially males, is lower than that of other species. Reagent strips measure levels of conjugated bilirubin with the diazotization method. This occurs by coupling bilirubin with diazotized dichloroaniline in an acidic environment. Bilirubin is very unstable when exposed to room air and light. Thus, urine specimens should be tested soon after collection. Positive test results may be observed in concentrated urine of healthy dogs. In dogs, the renal threshold for bilirubin is low and renal tubules are able to break down heme and produce some renal bilirubin, therefore slight bilirubinuria can be a normal finding in dogs with concentrated urine. However, bilirubinuria is always abnormal in cats. Bilirubinuria may indicate: liver disease, bile duct obstruction, starvation, hemolysis, or pyrexia. Bilirubinuria in bile duct obstruction is often more severe than that of hepatocellular disease. False positive test results may occur if high doses of chlorpromazine, which lowers urine pH, have been given. A metabolite of etodolac (Lodine), also produces false positive test results. False negative test results may occur in urine samples with high ascorbic acid or nitrite concentration.

## KETONES

Acetone, acetoacetic acid, and beta-hydroxybutyric acid are ketones and they are produced by an exaggerated and incomplete oxidation of fatty acids. Glomeruli freely filter ketones and the tubules then resorb them completely. If the tubular resorptive capacity is saturated, then the ketones are incompletely resorbed, resulting in ketonuria. Ketonuria occurs quickly in younger animals and is more easily detected than ketonemia. Ketonuria does not signify renal disease, but rather excessive lipid or defective carbohydrate metabolism. Dipstick tests are semiquantitative and only detect acetone and acetoacetic acid. Reagent strips contain nitroprusside that does not react with beta-hydroxybutyric acid. Ketonuria may be caused by starvation, insulinoma, diabetic ketoacidosis, persistent hypoglycemia, high fat low carbohydrate diets, and glycogen storage disease. False positive test results may occur if urine is pigmented, or has high concentrations of levodopa metabolites.

## SPECIFIC GRAVITY

Urine specific gravity is based on the ratio of weight of urine to weight of an equivalent volume of pure water. This test is used to measure tubular function. The dipstick measures specific gravity by measuring the change in pKa of polyelectrolytes in relation to ionic concentration. The normal values of the density of urine range from 1.001 to 1.035. Although dipstick strips do have a method of approximating specific gravity, this measurement is best made with a refractometer. Urine specific gravity measured by the dipstick can be falsely elevated by moderate to high concentrations of protein. Low reading may occur if the urine is alkaline. High lipid content in urine may also alter the results by either raising or lowering the specific gravity measurement.

## BLOOD

Normally the blood is not detected in the urine (0.010 mg/dl; 3 red blood cells/L). The blood test will react positively in the presence of red blood cells, free hemoglobin or free myoglobin. Hemoglobin usually is bound and is too large to pass through the glomerular filter. If the renal threshold is exceeded, the hemoglobin can pass into the urine. Myoglobin on the other hand, is not bound and freely passes through the glomerular filter. Myoglobin can be detected in urine before a change in plasma color is apparent. The presence of free red blood cells results in a positive test then blood cells lyse and hemoglobin is released. Healthy animals should have negative test results. This test is based on a pseudoperoxidase reaction, which is more sensitive to hemoglobin and myoglobin than intact red blood cells. A positive occult blood test indicates hematuria, hemoglobinuria, or myoglobinuria. Further evaluation of the urine sediment is needed if a positive test result is found. Most commonly, hematuria is the cause of the positive test result while myoglobinuria is rare.

Hematuria can be caused by trauma, infection, inflammation, infarction, calculi, neoplasia or a coagulopathy anywhere along the urinary tract. In cases of hematuria, the urine is red and cloudy, but will clear if centrifuged. Microscopic evaluation of the urine sediment will reveal red blood cells.

Hemoglobinuria, on the other hand, will have reddish brown urine that does not become clear after centrifugation. The microscopic evaluation of urine sediment will not reveal red blood cells. With intravascular hemolysis, plasma will have a reddish tint due to hemoglobinemia that is detectable prior to hemoglobinuria. The patient usually will be clinically anemic.

A false positive test result may occur if the urine is contaminated with bleach, or contains large amounts of iodide or bromide. If a voided sample is collected from a bitch in heat, a false positive test may also occur. In this case a cystocentesis sample is preferred for analysis. Microbial peroxidase that is present in some urinary tract infections, can also lead to false positive test results. False negative test results may occur if the urine is not well mixed prior to evaluation. This is due to the fact that red blood cells often sediment quickly.

## pH

The pH of urine can vary depending on an animal's diet as well as its acid-base status. For example, animals that primarily eat high protein meat-based diets will have acidic urine. On the other hand, animals that eat more vegetable-based diets will have an alkaline urine.

The urine sample should be fresh as urine becomes more alkaline on standing due to the conversion of urea to ammonia by bacteria (if present), and loss of CO<sub>2</sub>.

Causes of acidic urine include: meat diet, systemic acidosis, hypochloridemia, and administration of acidifying agents such as D,L-methionine or NH<sub>4</sub>Cl. Urine with high concentrations of glucose may have a lower pH. This is due to bacterial metabolism of glucose and production of ammonia which lowers pH.

Causes of alkaline urine include: vegetable based diet, bacterial infection of urease-producing bacteria, systemic alkalosis, urine exposed to room air for an extended time (loss of CO<sub>2</sub>), and administration of alkalinizing agents including citrate or NaHCO<sub>3</sub>.

Urine pH also may provide good predictive assessment of crystal and stone morphology as certain crystals and stones form in either acidic or alkaline environments. Uric acid, cystine, and calcium oxalate crystals are found in acidic urine. On the other hand, struvite, calcium carbonate, calcium phosphate, ammonium biurate, and amorphous phosphate crystals are found in alkaline urine.

For a more accurate assessment of urine pH, a pH meter may be used. However, for most routine veterinary analyses a dipstick pH reading is sufficient.

## PROTEIN

Dogs and cats normally have small proteins that pass through the glomerular filter, however a majority of these proteins are resorbed by the renal tubules. The renal nephron does excrete a small amount of Tamm-Horsfall protein. Thus, only a very small amount of protein is normally excreted in the urine, which is not usually clinically detectable (<20 mg/dL). The protein portion of the dipstick reagent strip measures the protein based on a pH dye indicator method using bromophenol blue. Due to the negative charge of albumin, if protein (albumin) is present in urine, the pH increases, and a positive test result occurs. This test is primarily sensitive to albumin is relatively insensitive for the detection of globulins and Bence-Jones proteins. Positive protein results must be evaluated in relationship to the patient's history, physical examination, method of urine collection, urine specific gravity, and microscopic sediment examination. Proteinuria may be due to hemorrhage, infection, intravascular hemolysis, or renal disease. Hemorrhage is confirmed by a positive occult blood reaction on the dipstick and the presence of red blood cells in the sediment. A urinary infection or cystitis can be confirmed by observing bacteria and white blood cells on sediment examination. Cases of intravascular hemolysis have hemoglobinuria leading to a positive occult blood test. Proteinuria of renal disease may be due to glomerular and/or tubular lesions. If the proteinuria is due to renal disease, the occult blood test will be negative and the sediment may or may not contain casts. Determination of the urine protein/creatinine ratio is helpful in confirming renal proteinuria. Protein results must be analyzed with the urine specific gravity. Trace proteinuria may represent significant protein loss with low specific gravity, but not with high specific gravity. False positive protein reactions may occur with alkaline urine or if a disinfectant residue is in the urine, possibly from improper cleaning of the collection container. Samples containing urease-producing bacteria may have an elevated pH resulting in a false positive test result. False negative test results may occur in dilute or acidic urine. If the urine protein dipstick is positive for protein, the sample should be further analyzed with a quantitative method at an outside laboratory.

## CREATININE

Creatinine is a byproduct of muscle metabolism and creatinine excretion into the urine is usually constant. Creatinine measurement is used in the diagnosis and treatment of renal diseases, to monitor renal dialysis, and as a calculation basis for measuring other urine analytes. Though the concentration (or dilution) of urine varies throughout the day, the urinary creatinine level is relatively stable which allows its measurement to be used as a corrective factor in random/spot urine samples. When albumin and creatinine are measured simultaneously from a single-void / random urine sample, the albumin to creatinine ratio (A/C) can be determined.

Visibly dark brown color urine may affect the results. Substances that cause abnormal urine color, such as drug containing azo dyes, nitrofurantoin, riboflavin may affect the results. The urine of healthy individuals contains 10-300 mg/dl of creatinine. Very low creatinine results can be caused by adulteration of the urine specimen or by severe renal failure.

### Protein to creatinine ratio (ratio P/C)

Determine Protein/Creatinine Ratio as follows:

Protein/Creatinine Ratio = Protein Result (mg/dL) / Creatinine Result (mg/dL).

Protein/Creatinine persistently  $\geq 0.5$  is indicative of an abnormal degree of proteinuria, whereas a Protein / Creatinine < 0.5 is consistent with absence of significant proteinuria.

Ratio P/C		Creatinine (mg/dl)				
		10	50	100	200	300
Protein (mg/dl)	5-20	Red	Orange	Green	Green	Green
	30	Red	Orange	Green	Green	Green
	100	Red	Orange	Green	Green	Green
	300	Red	Orange	Green	Green	Green
	1000	Red	Orange	Green	Green	Green
		normal	abnormal	High abnormal		
Ratio P/C		< 0.5	0.5 - 1	> 1		

1 dl = 100 ml

## NITRITE

The nitrite portion of the dipstick analysis has limited value in veterinary medicine. This is due to the high number of false negative test results in small animals. Nitrites occur in urine during some bacterial infections. In order to achieve an accurate positive test result, the urine must have been retained in the bladder at least 4 hours. Therefore, it is best to collect a (first) morning sample or ensure the patient has not urinated in at least 4 hours. A positive test indicates a bacterial infection. Gram-negative rods are more likely to produce a positive test response.

Negative test results do not exclude infection. The urinary tract infection may involve organisms that do not convert nitrites, or the urine may not have been held in the bladder greater than 4 hours.

## LEUKOCYTES

Normally leukocytes are not detected in the urine of a healthy animal. The leukocyte test detects the presence of white blood cells or partial cells in the urine. In dogs, this test is indicative of pyuria but false negative test results often occur. False positive test results often occur in cats, and this test is clinically unreliable. False positive test results also may occur in the event of fecal contamination.

False negative test results may develop if the patient has been treated with high doses of tetracycline or other antibiotics. Glucosuria or increased urine specific gravity may cause false negative test results. False negative test results may be observed with voided urine samples obtained from animals with pyometra or prostatitis.

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