URINARY ANALYSIS

INTENDED USE

Analysis is an important tool in disease detection, as well as monitoring and screening animal health. Abnormalities can be indicative of diseases of the urinary system as well as other organ systems, including liver function, acid-base status, and carbohydrate metabolism. Complete blood count (CBC) is a less expensive alternative, but can be performed by gross visual assessment of the urine, microscopic examination, and chemical evaluation.

TESTING METHODS

Dipssticks may be removed from the air tight, light sealed containers. It is important not to touch the reagent areas of the strip as this may alter test results. Each test is performed on a blank sample with no contamination from the distal urogenital tract; however, contamination from the urethra may still occur. Contaminants include epithelial cells or red blood cells. Poor catheterization may result in a ruptured bladder. This method may have the same cellular contaminants as a bladder trauma resulting in hematuria, and in some instances (such as urethral obstruction) the patient's bladder is gently squeezed until urine is expressed. This test is best made with a refractometer.

QUALITY CONTROL

For best results, performance of reagent strips should be confirmed by testing known negative and positive control materials (e.g., MAS QA Control, BIO-LAD Rapid Urobilinochrome). Replace the bottle cap immediately and tightly after removing test strips, and keep the vial in its original container until ready to use. Discoloration or darkening of the test vials 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 that the canister has been removed, the remaining strips remain stable for use up to 6 months.

SAMPLE COLLECTION

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Microalbumin to Creatinine Ratio (ACR)

Microalbumin is normally present in urine at concentrations of less than 30mg albumin / g creatinine. Microalbuminuria is indicated at a ratio of 30–300mg/g (Abnormal) and clinical albuminuria at a ratio of >300mg/g (High Abnormal).

The following table is used to obtain the Microalbumin to Creatinine ratio.

<table>
<thead>
<tr>
<th>Microalbumin mg/dl (mg/L)</th>
<th>Creatinine mg/dL (mmol/L)</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (10)</td>
<td>10 (0.9)</td>
<td>Normal</td>
</tr>
<tr>
<td>3 (30)</td>
<td>50 (4.4)</td>
<td>Normal</td>
</tr>
<tr>
<td>8 (80)</td>
<td>100 (8.8)</td>
<td>Normal</td>
</tr>
<tr>
<td>15 (150)</td>
<td>200 (17.7)</td>
<td>High Abnormal</td>
</tr>
<tr>
<td>30 (300)</td>
<td>300 (26.5)</td>
<td>Abnormal</td>
</tr>
</tbody>
</table>

* Specimen is very dilute to decide accurately ratio result. Repeat test with new specimen, preferably a first-morning collection.

**CALCULATIONS:**

Determine Microalbumin / Creatinine Ratio as follows:

Microalbumin = Microalbumin Result (mg/mL) / Creatinine Result (g/L)

Microalbumin Result = mg Albumin / g Creatinine

Example:

Microalbumin Result = 30 mg/mL
Creatinine result = 200 mg/dl = 2g/L
Microalbumin / Creatinine Ratio = 15mg/g
Result = 30 mg/g (Normal)

Microalbumin / Creatinine Ratio Interpretation

<table>
<thead>
<tr>
<th>Normal</th>
<th>Abnormal</th>
<th>High Abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conc. (mg/g)</td>
<td>&lt;30</td>
<td>30-300</td>
</tr>
<tr>
<td>Conc. (g/mmol)</td>
<td>&lt;3.4</td>
<td>3.4-33.9</td>
</tr>
</tbody>
</table>

Protein to Creatinine Ratio (PCR)

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

The following table is used to obtain the Protein to Creatinine ratio.

<table>
<thead>
<tr>
<th>PCR Result Interpretation</th>
<th>Creatinine (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein (mg/dL)</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>Normal</td>
</tr>
<tr>
<td>30</td>
<td>High Abnormal</td>
</tr>
<tr>
<td>100</td>
<td>Abnormal</td>
</tr>
<tr>
<td>300</td>
<td>Abnormal</td>
</tr>
<tr>
<td>1000</td>
<td>Abnormal</td>
</tr>
</tbody>
</table>

**CALCULATIONS:**

Determine Protein / Creatinine Ratio as follows:

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

Protein/Creatinine Ratio Interpretation

<table>
<thead>
<tr>
<th>Normal</th>
<th>Abnormal</th>
<th>High Abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein/Creatinine Ratio</td>
<td>&lt;0.5</td>
<td>0.5-1</td>
</tr>
</tbody>
</table>

**NOTES ON SYMBOLS**

In vitro diagnostic

Use By/Expiry Date

Do not re-use

Store at

Keep away from sunlight

Number of test strips

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388-25, Gomo-ro, Jillye-myeon, Gimhae-si, Gyeongsangnam-do, Republic of Korea

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**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 fbrin soluble protein. Thus, only a very small amount of protein is normally excreted in the urine, which is usually clinically detectable.

The protein portion of the dipstick reagent strip measures the protein based on a pH dye indicator method using bromphenol 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 and 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 oxid blood reaction on the dipstick and the presence of red blood cells in the sediment. A urinary infection or crystals can be confirmed by observing bacteria and white blood cells on sediment examination. Cases of intravascular hemolysis have hemoglobinuria leading to a positive oxid blood test. Proteinuria of renal disease may be due to glomerular and/or tubular lesions. If the proteinuria is due to renal disease, the oxid blood test will be negative and the sediment may or may not contain casts. Determination of the urine protein:urine 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 diuretic 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.

**Nitrile**

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. Nitrates 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 nitrates, or the urine may not have been held in the bladder greater than 4 hours.

**Leukocytes**

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 occur 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 positive test results may be observed with voided urine samples obtained from animals with pyometra or prostatitis.

**Microalbumin**

This test is based on dye binding using sulfonphenethylamine dye. At a constant pH, albumin binds with sulfonphenethylamine dye to develop a blue color. The following substances may cause false positive test results: a large amount of hemoglobin (25mg/dl), visibly bloody urine, highly alkaline urine (pH>8), disinfectant including quaternary ammonium compound.

Normal albumin levels in urine are under 2mg/dl. Microalbuminuria is indicated with results of 3–30mg/dl.

**Creatinine**

Copper creatinine complex has pseudoperoxidase activity that catalyze the oxidation of a chromagen to a colored end product. 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 10–300mg/dl of creatinine. Very low creatinine results can be caused by adulteration of the urine specimen or by severe renal failure.

Protein

- Normal
- Abnormal
- High Abnormal

Microalbumin

- Normal
- Abnormal
- High Abnormal

Creatinine

- Normal
- Abnormal
- High Abnormal