

As per new CBCS syllabus of SPPU

K. T. S. P. Mandal's
Hutatma Rajguru Mahavidyalaya,
Rajgurunagar.

Department of Zoology

T. Y. B. Sc.

Semester VI

Paper I - ZO 361

Medical and Forensic Zoology

Chapter 3 – Urine Analysis

By

Prof. D. R. Borhade

As per new CBCS syllabus of SPPU

INTRODUCTION :

A liquid excrement consisting of water, salts, and urea, which is made in the kidneys then released through the urethra.

urinalysis: A urinalysis (UA), also known as Routine and Microscopy (R&M), is an array of tests performed on urine, and one of the most common methods of medical diagnosis.

Urine, a typically sterile liquid by-product of the body, is secreted by the kidneys through a process called urination and excreted through the urethra. Urine is often used as a diagnostic feature for many disease conditions. These may be based on either physical or chemical components, that may give insight to processes within the body, often through urinalysis, a common clinical analysis of urine.

PHYSICAL CHARACTERISTICS

Physical characteristics that can be applied to urine include color, turbidity (transparency), smell (odor), pH (acidity – alkalinity) and density.

Composition: Normal urine is composed of about 95 percent water and 5 percent solutes. Normal solutes found in urine include: Urea, Creatinine, Uric acid, Ketone bodies, Potassium, Sodium, Chloride.

Color: Typically yellow-amber, but varies according to recent diet and the concentration of the urine. Drinking more water generally tends to reduce the concentration of urine, and therefore causes it to have a lighter color. Dark urine may indicate dehydration. Red urine indicates red blood cells within the urine, a sign of kidney damage and disease.

Smell: The smell of urine may provide health information. For example, urine of diabetics may have a sweet or fruity odor due to the presence of ketones (organic molecules of a particular structure) or glucose. Generally fresh urine has a mild smell but aged urine has a stronger odor similar to that of ammonia.

pH: The pH of normal urine is generally in the range 4.6 – 8, with a typical average being around 6.0. Much of the variation occurs due to diet. For example, high protein diets result in more acidic urine, but vegetarian diets generally result in more alkaline urine (both within the typical range of 4.6 – 8).

Density: Density is also known as “specific gravity.” This is the ratio of the weight of a volume of a substance compared with the weight of the same volume of distilled water. The density of normal urine ranges from 0.001 to 0.035.

As per new CBCS syllabus of SPPU

Turbidity: The turbidity of the urine sample is gauged subjectively and reported as clear, slightly cloudy, cloudy, opaque or flocculent. Normally, fresh urine is either clear or very slightly cloudy. Excess turbidity results from the presence of suspended particles in the urine, the cause of which can usually be determined by the results of the microscopic urine sediment examination. Common causes of abnormal turbidity include: increased cells, urinary tract infections or obstructions.

Abnormalities in any of these of physical characteristics may indicate disease or metabolic imbalances. These problems may seem superficial or minor on their own, but can actually be the symptoms for more serious diseases, such as diabetes mellitus, or a damaged glomerulus.

ABNORMAL CONSTITUENTS:

Abnormal urine colour is important clue for differential diagnosis. Urine is important part of investigation. Normal colour of urine varies from pale yellow to deep amber which is largely dependent on concentration of urine. In a healthy normal person urine has little or no odor. Though many times colour and odor of urine changes which is not always a sign of disease, but it must not be ignored because it may be a part of underlying disease particularly if patient is symptomatic. Therefore treating Physician should investigate appropriately

ABNORMAL COLOR OF URINE

Red Urine- Red urine is a frequent complaint and it may be due to medical or nonmedical conditions. If urine analysis shows red blood cells or haemoglobin, it is called hematuria. Various causes of red urine are summarised as – (I). Organic causes-Haematuria (due to vascular, glomerular, interstitial and uroepithelial causes), Hemoglobinuria (due to intravascular hemolysis such as sickle cell anaemia, thalassemia, transfusion reactions and Glucose 6 phosphate dehydrogenase deficiency, Myoglobinuria (due to ischemic damage of muscles, crush injuries, and vigorous exercise

Food- carrots, black berries and beet root

Orange Urine- A number of conditions are associated with orange urine and it may be helpful to reach a diagnosis. Following conditions may be associated with orange urine. Organic causes- Bile pigments, urinary tract infection caused by Gram negative bacilli Drug causes- high dose of riboflavin, rifampin vitamin C , Food- carrots.

Purple Urine- The only known cause of purple urine is purple bag syndrome, Sometimes Gram negative bacteruria is also associated with purple urine.

Blue / Green Urine- Blue- green urine is not very uncommon entity. It may be useful for clinician to suspect the following disorders. Organic causes- bacteraemia or Urinary tract infection caused by pseudomonas.

Yellow urine- Yellow urine is commonly associated with following conditions. Organic causes- liver disorders. Drugs- vitamin B-complex, rifampin. Food – carotene.

As per new CBCS syllabus of SPPU

Brown urine- Following conditions should be suspected if urine is brown in color. Organic causes– hemolysis, Copper poisoning food- beans.

Black Urine- Black urine may be a diagnostic clue for the given conditions.

White urine- white urine or Albinuria is associated with a variety of conditions

which may help a clinician to make diagnosis of following disorders- chyluria due to filariasis, lymphatic fistula

ABNORMAL TURBIDITY OF URINE

Urine is normally transparent but can be turbid in various conditions. Such as UTI, heavy hematuria and genital secretion contamination.

ABNORMAL ODOR OF URINE

Urinary odor is also a helpful parameter in urine analysis which is characteristics in following conditions.

1. Pungent odor- It is due to production of ammonia present in bacterial UTI.
2. Sweet or fruity odor- It is associated with ketones in urine.
3. Maple syrup odor- It indicates maple syrup disease.
4. Musty or mousy odor- It is characteristic of phenylketonuria.
5. Fishy or rancid butter odor- It is caused by hypermethioninemia.
6. Sweaty feet odor- It is present in isovaleric acidemia and Glutaric acidemia type II.
7. Cat's urine odor- It is found in 3-Methylcrotonyl glycinuria.
8. Boiled cabbage odor- It is found in Tyrosinemia type I.
9. Swimming pool odor- It is present in hawkinsinuria.
10. Hops like odor- It is associated with oasthouse urine disease.
11. Fecal odor- It is characteristic of bladder- intestinal fistula.

ABNORMAL SPECIFIC GRAVITY OF URINE

Specific gravity (SG) is a function of number and weight of dissolved particles. It can be measured with refractometer or hygrometer or dipstick test. Normal range of SG is 1.003 to 1.030. It may be affected by urine temperature, glucose, proteins, mannitol, dextran, diuretics, radiocontrast media and some antibiotics. It is marked with a scale from 1.000 to 1.060 on urinometer. On the basis of specific gravity urine may be Isosthenuric- when SG is 1.010. It means urine SG is similar (and osmolality) as plasma eg. Acute tubular necrosis and chronic kidney disease. SG from 1.000 to 1.003 – it is associated with marked urinary dilution such as diabetes incipidus or water intoxication. (III) SG above 1.040 – it is almost always associates with osmotic agents eg. Contrast material.

RENAL FAILURE

Renal failure is a condition in which the kidneys fail to remove metabolic end-products from the blood and regulate the fluid, electrolyte, and pH balance of the extracellular fluids. The underlying cause may be renal disease, systemic disease, or urologic defects of nonrenal origin.

As per new CBCS syllabus of SPPU

Renal failure can occur as an acute or a chronic disorder. Acute renal failure is abrupt in onset and often is reversible if recognized early and treated appropriately. In contrast, chronic renal failure is the end result of irreparable damage to the kidneys. It develops slowly, usually over the course of a number of years.

ACUTE RENAL FAILURE

HERM ZOOLOGY