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Write a short note on urinalysis

A urinalysis is a simple test that looks at a small sample of your urine. It can help find problems that need treatment, including infections or kidney problems. It can also help find serious diseases in the early stages, like **kidney disease**, **diabetes**, or liver disease. A urinalysis is also called a “urine test.”

A urine test can include three parts:

- **Visual exam.** The urine will be looked at for color and clearness. Blood may make urine look red or the color of tea or cola. An infection may make urine look cloudy. Foamy urine can be a sign of kidney problems.
- **Microscopic exam.** A small amount of urine will be looked at under a microscope to check for things that do not belong in normal urine that cannot be seen with the naked eye, including red blood cells, white blood cells (or pus cells), bacteria (germs), or crystals (which are formed from chemicals in the urine and may eventually get bigger and become kidney stones).
- **Dipstick test.** A dipstick is a thin, plastic stick with strips of chemicals on it. It is dipped into the urine. The strips change color if a substance is present at a level that is above normal. Some of the things a dipstick examination can check for include:
 - **Acidity (pH)** is a measure of the amount of acid in the urine. A pH that is above normal may be a sign of kidney stones, urinary infections, kidney problems, or other disorders.
 - **Protein** is an important building block in the body. Everyone has protein in their blood. But it should only be in your blood, not your urine. Your kidneys play a role in this process. Healthy kidneys remove waste products and extra water from your blood, but leave behind the things your body needs, like protein. When kidneys are injured, protein leaks into your urine. Having protein in your urine suggests that your kidney's filtering units are damaged by kidney disease.
 - **Glucose (sugar)** is usually a sign of diabetes.
 - **White blood cells (pus cells)** are signs of infection.
 - **Bilirubin** is a waste product from the breakdown of old red blood cells. It is normally removed from the blood by the liver. Its presence in the urine may be a sign of liver disease.
 - **Blood:** It can be a sign of an infection, a kidney problem, certain medicines, or even heavy exercise. Finding blood in the urine requires further testing. It does not mean you have a serious medical problem.

A urinalysis can help to detect many diseases before you feel symptoms. Finding and treating a problem early can help keep serious diseases from getting worse.

Urinalysis (urine test, UA) simply means analysis of urine. This is a very commonly ordered test which is performed in many clinical settings such as physicians' offices, hospitals, clinics, emergency departments, and outpatient laboratories. Urinalysis is a simple test that can provide important clinical information, has a quick turn-around time, and is also cost effective.

What Can Be Detected In a Urine Test?

Results of a urinalysis may be helpful in:

- diagnosing urinary tract infections(UTIs),
- diagnosing kidney stones,
- screening for and evaluating many types of kidney diseases, and
- diagnosing and monitoring the progression such as diabetes mellitus and high blood pressure(hypertension).

How Do You Take a Urine Test?

The urinalysis test involves the collection of a urine sample in a specimen cup. The proper collection of a sample is very important to avoid contamination of urine.

The collection technique is different for men and women. Alcohol wipes should be avoided as these may irritate the area.

- For men, the opening of the urethra (tip of the penis) should be wiped clean with a cleansing wipe before the collection is begun.
- In women, the area around the urethra also needs to be wiped clean with a cleansing wipe. The woman then spreads the labia of the external genitalia and wipes from front to back.
- After the urethra is properly cleaned, the collection may begin by discarding the initial stream of urine into the toilet.
- Then, 10-15 milliliters (ml) of urine may be collected in the provided sterile specimen cup by directly urinating into the cup.
- Once an adequate amount is collected, then the remaining urine should be voided in the toilet.

This technique is called the mid-stream clean catch urine sample collection.

Other collection methods may be necessary depending on the specific situation. Frequently, hospitalized patients may have a urinary catheter (Foley catheter) placed in the bladder that directly drains urine from the bladder into a bag. The nursing staff simply collects the urine from the collection bag into the sterile cup. Samples can be collected from babies and toddlers who are not yet toilet trained by attaching a small collection bag with a bandage-type adhesive to the external genital region.

The collected urine sample should be analyzed soon (within 1-2 hours) after collection. If this is not possible, then the sample may be refrigerated.

What Is a Urine Dipstick Test?

The main advantage of the urine dipstick test is that it is a convenient and rapid test. The results are usually determined within a few minutes after collecting the sample. Therefore, it is very useful in settings such as emergency departments, urgent care facilities, or the doctor's office. It is also very cost effective and does not require special training to perform the test.

However, the dipstick may not be very accurate as the color changes are very time sensitive. For example, if the dipstick is not promptly analyzed as it is taken out of the urine sample, then the color changes may be inaccurate after more than a few minutes of exposure to urine. The information that urine dipstick provides may also be limited, as it is generally a qualitative test and not a quantitative one. The dipstick test is considered a screening test, and positive results must be confirmed with more definitive testing.

What Is Macroscopic Urine Test?

The term macroscopic refers to observations that are visible with the naked eye and do not require examination under a microscope. Macroscopic analysis of the urine is done by inspecting the physical appearance of the urine. Normal urine is light yellow and clear. Macroscopic urinalysis notes the amount, color, and clarity of the urine as well as any other visible characteristics of the urine such as the presence of blood or blood clots, precipitates, or sediments.

The information from the macroscopic urinalysis may provide important clues to the health care practitioner performing the test. A normal urine sample may be reported as clear and yellow without any cloudiness.

- Obvious abnormalities in color, clarity, and cloudiness may suggest conditions such as:
 - dehydration,
 - infection,
 - liver disease, or
 - muscle breakdown (rhabdomyolysis).
- Certain medications may change the color of urine.
- Visible blood in the urine (gross hematuria) may suggest a kidney stone or more serious causes such as cancer of the urinary tract.
- Foamy urine may indicate the presence of protein in the urine (proteinuria) due to certain kidney conditions that spill protein out of the kidney from circulating blood (nephrotic syndrome).
- A dipstick test is usually performed on the urine specimen to check for:
 - glucose (sugar) in the urine,
 - ketone in the urine (metabolic waste product),
 - blood in the urine (detected as hemoglobin in the urine),
 - leukocyte esterase (suggests white blood cell in the urine),
 - nitrites (evidence of any bacteria in the urine),
 - bilirubin, and
 - urobilinogen in the urine (related to an elevated bilirubin level, denoting possible liver disease or red blood cell breakdown in the body).

The color change in each of the squares on the dipstick signifies a specific abnormality found in the urine represented by that specific color. If there are no abnormalities in the urine, the squares maintain their original color. The changes in color may take from a few seconds up to a couple of minutes to occur. The interpretation of the urinalysis by a dipstick is simply done by comparing the colors on the stick to the reference color changes that are readily available on the dipstick box.

What Is Microscopic Urine Test?

Microscopic urinalysis refers to the analysis of urine under the microscope. It requires a simple light microscope and is done by physicians or trained technicians. The results from microscopic urinalysis are generally more quantitative in terms of white blood cells or red blood cells in the urine, the presence of bacteria in the urine, and the amount of cellular debris in the urine.

How Do You Take a Microscopic Urine Test?

Microscopic urinalysis entails placing a few milliliters of the collected urine sample into a special test tube with a cap. The test tube is then spun down (centrifuged) for a few minutes. The liquid part of urine on the top (the supernatant) is discarded with only a drop or two remaining in the tube. The solid part at the bottom of the tube (urinary sediment) is then gently mixed with the few drops of liquid urine left on top of it. A drop of this mix is then transferred using a small pipette onto a thin glass slide and analyzed under the microscope.

The urinary sediment is analyzed to look for white blood cells, red blood cells, epithelial cells (cells that line the urethra or bladder), and bacteria in the urine. Under the microscope, an estimate of the number of these components is typically assessed and reported. The quantity of these cells may provide additional clinical information.

Other useful information detected by the microscopic urinalysis is the evaluation of cellular elements in the urine. These cellular elements may represent debris from the kidney cells due to injury, inflammation, or infection of the kidneys, and usually are formed in tube-like structures called casts. There are many different types of casts that may be detected in the urine, each suggesting certain possible kidney conditions.

Sometimes crystals can be seen in the urine under the microscope. Small amounts of crystals in the urine may be normal in healthy people. Some nonspecific crystals may be seen in urine as a result of the urine sample not being freshly analyzed (within 1-2 hours), being kept at a cold temperature, or from acidic (low pH) urine. In other instances, specific crystals may be

detected in urine (crystalluria) as a result of different types of kidney stones.

Some antibiotics and anti-viral drugs may also promote crystal formation in urine.

What Cells Can Be Detected In a Urine Test?

Some of the cells detected in a urinalysis are epithelial cells, red blood cells, and white blood cells. Epithelial cells are the cells lining many structures in the body, such as the urethra, bladder, ureters, vagina, or skin. The presence of epithelial cells in the urine may represent contamination of the sample; however, these cells in the urine may also be associated with an inflammation or infection of the urethra or bladder.

With microscopic analysis, the number of cells in the urine can be estimated, and the number of cells (white blood cells, red blood cells, epithelial cells, and bacteria) in the urine is reported as the number of cells seen in one high power field (number of cells viewed in one field under the highest magnification of the microscope lens).

What Do Red Blood Cells in the Urine Mean?

The presence of intact red blood cells in the urine usually signifies a source of blood loss in the lower part of the urinary tract (urethra, bladder, ureters). Blood in the urine may be visible by the naked eye (gross hematuria) or only under the microscope (microscopic hematuria). Gross hematuria may be related to trauma to the urinary tract, kidney stones, kidney cancer, bladder tumors, or hemorrhage.

Microscopic hematuria (red blood cells were seen only under a microscope) may indicate an infection in the lower urinary tract or a kidney stone. Sometimes, red blood cells may be seen in the form of red blood cell casts, and this generally points to the kidney as the source, such as an inflammation of the kidney (glomerulonephritis).

What Do White Blood Cells in the Urine Mean?

White blood cells (or leukocytes) in the urine may be detected in the microscopic analysis of urine. In general, the presence of these cells in the urine is suspicious for a urinary tract

infection (UTI). Other supportive evidence of a UTI may include bacteria in the urine, leukocyte esterase and nitrite on the dipstick, and clinical evidence of urinary tract infection.