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URINALYSIS

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.

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.

At the microscopic level, your body is constantly working to keep you healthy, even while you sleep. Complex chemical processes take place throughout the body, including the breakdown of proteins

known as amino acids. When your body breaks down amino acids, ammonia is left over as waste. That's not something you want in your body for long—ammonia is toxic to human cells.

Since ammonia is toxic to your body, you need a way to remove it. That happens partly in the liver, where the ammonia is broken down into the less-toxic chemical, urea. Urea then combines with water and gets flushed into your bladder through the kidneys as urine, protecting your body from its own chemical processes.

What Is Urine Made of?

In the simplest terms, urine is about 95% water and 5% urea and other solids. But urine is much more complex than this simple formula suggests. Urine contains five to 10 times the number of chemical compounds found in other common body fluids like saliva—more than 3,000 different chemical compounds in total. Your pee contains the remnants of the various foods you eat, as well as drug byproducts, bacterial waste, cosmetics, and chemicals found in your environment.

If your pee smells unusual, there may be several reasons. Vitamins can change the smell of urine, and so can pharmaceuticals. Certain foods are infamous for making pee smell stronger, such as asparagus, Brussels sprouts, garlic, coffee, and foods with lots of vitamin B-6 such as bananas and salmon. Also, if you aren't drinking enough water your pee can smell stronger than usual.

Serious health problems can also affect the smell of urine. Infections in the bladder or kidneys, diabetes, and liver failure can all influence the smell. These problems leave a persistent smell, so if your urine changes odor and it stays that way no matter what you eat, tell your doctor.

Pregnancy Signs in Urine

For many couples, a home urine test brings the first news of pregnancy. Here's how a home urine pregnancy test works. The test is designed to find a hormone called human chorionic gonadoptropin (hCG). Your placenta produces hCG in abundance during the first few days when a pregnancy begins.

To perform this pregnancy test, you will need to collect your urine sample in a cup. After you have the urine, you will use a dipstick or an eyedropper depending on the test. Some tests also call for placing a dipstick in a stream of urine. Typically you will want to wait until the first day of your missed period to test your urine. Tests vary, so be sure to carefully follow the instructions given for any particular test.

When taken correctly, home urine pregnancy tests are estimated to be accurate 97% of the time. But not everyone takes these tests correctly. If your test shows up negative but you find other symptoms of pregnancy such as breast tenderness, nausea, and missed periods, give it a week and test again or ask your doctor for a blood test.

Kidney Problems

Your kidneys produce your urine, so using urine to find kidney problems shouldn't be surprising. Indeed, a variety of clues to the health of your kidneys can be found in a urine sample.

Kidney infections like glomerulonephritis, bacteriuria, and pyelonephritis can be discovered through urinalysis. So can atheroembolic renal disease, which occurs when cholesterol and other tiny bits of fat spread into the kidney's small blood vessels. Kidney problems due to excess protein in the urine (proteinuria) can be diagnosed by looking at the ratio of protein to creatinine in your pee. At other times a urine sample can reveal clues about kidney scarring (glomerulosclerosis), prerenal kidney injury, and kidney inflammation.

Inflamed Blood Vessels (Vasculitis)

When your blood vessels are inflamed, this may affect your kidneys. To find out if this is the case, a doctor will often order a urinalysis. Your physician will be looking for three clues to determine if your kidneys have been inflamed as well as your blood vessels. They look for high levels of protein (proteinuria), red blood cells (hematuria), and red blood cell clumps (casts).

If your doctor suspects kidney inflammation, you will likely receive more tests. This is because several other diseases mimic vasculitis, and also because treatment for this condition comes with serious risks. One other likely test will be a kidney biopsy. Since this procedure comes with a small but serious risk of bleeding, you will likely be monitored at the hospital for 24 hours.

Urinary Tract Obstruction

Your urinary system can become obstructed at several points. You could have a blockage at your kidneys, in the tube between your bladder and your kidneys (ureter), in the bladder itself, an enlarged prostate, or a blockage in the tube that carries your urine out of the body (urethra). Wherever the obstruction, some of its symptoms may appear in your pee.

The standard place for a doctor to begin to assess urinary obstruction is with a urinalysis. In the case of this disorder, your doctor will actually be looking for a normal urinalysis to rule out other causes.. If your urinary tract is obstructed you may also notice that the force of your pee is weak or interrupted, or that urine cannot be passed at all. Blood may also appear in your pee.

Ouch! Kidney Stones

If you don’t cringe at the thought of kidney stones, perhaps you don’t know how they are passed. Kidney stones are bits of material that form in the kidneys, and they can be as large as a pearl in the worst cases. These are eventually passed through the urethra, a process that is frequently very painful.

Once again, hints that you have kidney stones may be revealed by your pee. If you find that it is bloody, this may indicate kidney stones. The same is true if it is cloudy or smells awful. In addition, a urinalysis may reveal too much calcium in your pee, a condition known as hypercalciuria.

Lupus Nephritis

Lupus is an autoimmune disease wherein your body attacks itself. This can harm your healthy body tissue, and when the autoimmune reaction targets your kidneys, the condition is called lupus nephritis. The cause of this condition is unknown, but women are much likelier to develop it than men. The clues for this disease found in your pee may include blood or excessive protein. That's why urinalysis is commonly used as a test for patients with lupus.

Gallbladder and Liver Problems

If your pee is consistently dark and you've had plenty of water, this may indicate liver or gallbladder problems. Damage from certain drugs like acetaminophen (Tylenol), cancer, stones, and viruses are some of the many causes of these health problems.

Your pee turns dark because of a yellow fluid called bilirubin. Urobilinogen and other liver and gallbladder diseases can cause bilirubin to leak from your liver into your blood. If it's severe enough, this can also turn your skin and eyes yellow, a condition known as jaundice.

What Does Blue Urine Indicate?

Is your urine blue? Blue urine is a key indicator of an inherited disorder known as familial benign hypercalcemia. It's also called blue diaper syndrome since that's the color it leaves diapers of babies with this condition. It's generally not harmful, though fetuses with two sets of the responsible gene may suffer from severe neonatal primary hyperparathyroidism.

Collecting a Urine Sample

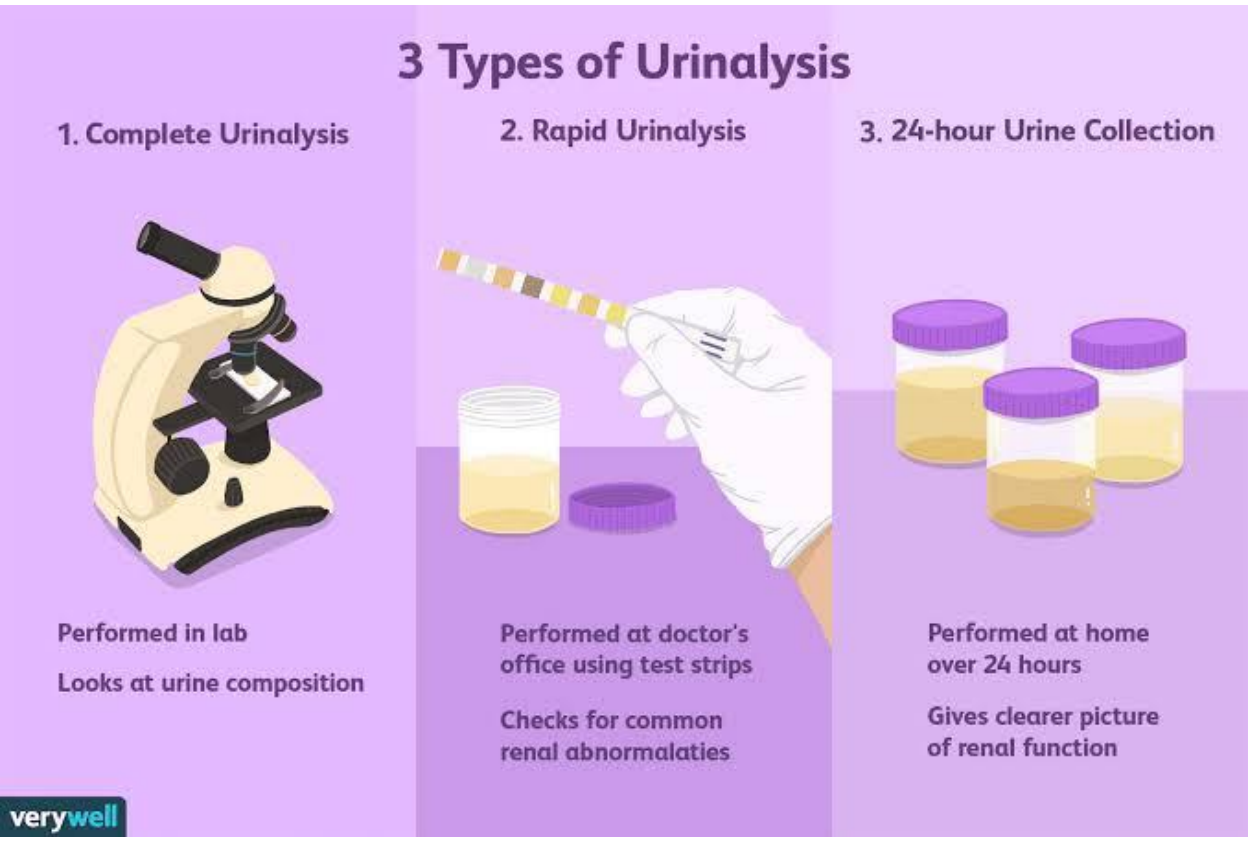
You've probably given a urine sample before. But did you know there's a wrong way and a right way? Though it's a common myth, urine is not actually sterile. It has low levels of bacteria even in healthy people. But too much bacteria indicates a potential infection in your urinary tract.

To rule out a urinary tract infection, it's essential to prevent a misreading of the number of bacterial clusters in your urine. To do this, you need to provide the sample in a special way. This is called the "midstream" or "clean-catch" urine collection method, which was developed in the 1950s.

What Is the Clean-Catch Method?

The point of clean-catch urine collection is to avoid germs. So the first step is to wash your hands thoroughly with hot, soapy water. Women should wash the area between their labia by sitting on the toilet, spreading their labia between two fingers and cleaning the inner folds, then the urethra where urine exits. Keeping the labia spread, you then pee into the toilet bowl, stop peeing, hold the cup a few inches from the urethra and fill the cup halfway.

Men have a different method. The first step is still hand-washing. Then clean the head of your penis. For uncircumcised men, pull the foreskin back before cleaning the head. Next, pee a bit and stop the flow, and then collect the pee in the cup until its half full. By following this method, you can assure your medical team has a more accurate understanding of your health.


3 Types of Urinalysis
1. Complete Urinalysis
2. Rapid Urinalysis
3. 24-hour Urine Collection
Performed in lab
Looks at urine composition
Performed at doctor's office using test strips
Checks for common renal abnormalaties
Performed at home over 24 hours
Gives clearer picture of renal function
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