Urinalysis Lab Report

Kimberly Bell

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Professor Niloufar Haque

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Introduction

The Urinary System is a system that consists of organs involved in the formation and excretion of urine. Urine is the waste product that's being eliminated from the body (95% water, 5% made up of urea, uric acid, creatinine, mineral salts, various pigments, and sugar. The organs are the kidneys, ureters, bladder, and urethra. The purpose of the system is to maintain the body's homeostasis, clean blood, and maintain the body's acid-base balance. The kidneys regulate water volume, solute concentration, blood pH levels, and erythropoietin production. The ureters are two muscular tubes (helps so urine does not flow back up) that are from the renal pelvis, in the kidneys, to the bladder. The bladder is sac lined by a series of folds called rugae (allows the bladder to expand as urine is collected). The urethra carries the urine from the bladder to the outside of the body.

Urinary tract infection is an infection that can affect any part of the urinary system. It occurs in females when fecal matter enters the urethra. Once it goes up the urethra, it can travel up to the bladder and cause an infection. If untreated, the infection can travel up to the kidneys and result in more severe symptoms. Women are more prone to it, when pregnant as well, than men because of our anatomy. Our ureters are shorter than men, which makes it easy for bacteria to travel up to the bladder easily. UTI can also be caused by sexual activity, improper hygiene, or menopause. Symptoms are the frequent urge to urinate without actually being able to pass much, extreme burning pain when you urinate, and/or when urine is cloudy or contains blood. Treatments are taking antibiotics, which will be cured and cleared within 2-3 days. In males, there are two sphincters, or valves, that keep the urethra closed to prevent leakage: the internal sphincter (located at the neck of the bladder), and external sphincter (located below the prostate gland and supported by the pelvic floor muscles). There is a common problem that occurs in men, called urinary incontinence. This is where involuntary leakage of urine happens (Newman, 2017). There are three types of incontinence: stress, urge and overflow. Treatment of these depends on the type of incontinence.

Urinalysis is a cheap, fast, and cost-effective test to see what should and should not be present in urine. It is a great indicator of what you would see if there is a disease somewhere in the urinary system. It can indicate any changes in color, specific gravity, pH, glucose, ketones, blood, protein, nitrites, leukocytes, and bilirubin and urobilinogen. Color can range from clear to cloudy (proteins or anything dissolved in urine or indicates an infection), or from colorless to amber (could be due to food, drugs, or the presence of blood).

Specific gravity looks at the concentration of the urine. Specifically, it looks at the osmolality in urine. The specific gravity of 1 is the reference point because there's nothing in water, but if you add something, for example, ions or glucose, the osmolality is going to increase; which will increase the specific gravity. Specific gravity is usually between 1.003-1.03. Anything above 1.03 is due to dehydration, there's not enough fluid. The proportion of stuff dissolved in urine is greater compared to the fluid. If it is below 1.003, it's going to indicate overhydration. Specific gravity can tell us if there is anything present. An example being if it's below 1.003. This could indicate diabetes incipidus, no glucose in the urine. The normal amount in urine is 0-0.8 mmol/L (Stang, 2018). This is a problem because it could indicate that in the brain, there is not enough ADH being produced, which then means that too much dilute urine is being produced.

For pH, it is looking at the concentration of hydrogen ions. It's a good indicator to see if there is any acid-base imbalance. Someone can have respiratory or metabolic acidosis or alkalosis. Respiratory acidosis means that a person is retaining too much CO_2 that turns to hydrogen ions and your blood becomes too acidic, pH goes down, Respiratory alkalosis means when you are breathing off or hyperventilating and getting rid of too much CO_2, pH goes up. The kidneys can produce urine of a pH of 4.5-8, which is commonly normal (uscfhealth). Usually for urine, if the pH is between 5.5-6.5, it means it is acidic.

Glucose is small enough to get filtered and reabsorbed back into the blood. There should be no glucose in urine. If there is, this indicates that you have invested so much sugar that it can not all be filtered. So it goes through the nephron and out into the urine. Ketones, like glucose, are a good indicator of diabetes, but for type 1. Ketones aren't usually present in urine, they are an alternative energy source. If there is no glucose present, the body has to make it from non-glucose base sources (fats and proteins). Type 1 diabetics produce no glucose, meaning no glucose is being utilized for energy. This then increases the number of ketones being produced.

Blood, in Urinalysis testing, is referring to the measurement of peroxidase activity. Peroxidase is an indicator of hemoglobin, myoglobin, and erythrocyte function. Blood is filtered through the glomerular filtration membrane. If there are erythrocytes present in urine, it could indicate that there is damage at the glomerular filtration membrane or there is an infection or damage to something in the urinary system, hematuria. Hemoglobin and myoglobin get filtered and reabsorbed, their amount is very low. Overproduction of these two can lead to them being more prominent in the urine.

The only types of proteins that can get filtered, at the glomerulus because they are small enough to pass through the filtration membrane, are albumin and some globulins. An increase presence of protein can happen in two ways. One way being transiently (short- term). Another way is long-term. Short-term can be because of heart failure, fever, or stress. Long-term effects could be because of damage to the glomerulus, glomerulonephritis.

The normal amount of nitrates should usually be 0. If there are any nitrites present in urine, this indicates that there is bacteria. Nitrites are byproducts of nitrogen waste (Fletcher, 2018). Bacteria then turns nitrates into nitrites. Overall indicating a urinary tract infection, UTI. Along with nitrites, leukocytes are a good indicator of infection as well. The presence of white blood cells, WBCs, in urine indicates that there is some type of infection, UTI. But to see if there is any bacteria in urine, a culture, used

to detect and identify

infectious processes (C. Shiel Jr,). If no bacteria is detected but there is still leukocytes, then that means that an inflammation is somewhere in the urinary system.

When red blood cells die, RBCs, they go to the spleen, the spleen breaks up hemoglobin, and heme goes into the liver and the liver turns it into bilirubin. Bilirubin can be can conjugated and unconjugated. Unconjugated bilirubin is water-insoluble, so the liver conjugates it by making it water-soluble. Some bilirubin can be present in urine. But if there's an excess amount of bilirubin and urobilinogen, it could mean that hemolysis is occurring; the liver is dysfunctional, a hepatic disease; or there's a problem with the bile or bile ducts.

Objective

The objective of this lab experiment is to compare and analyze the three urine samples and determine their abnormalities and what each abnormality means.

Materials and Methods

Urine analysis (UA) is an ordered panel of tests on a urine sample, which can evaluate: kidney failure, UTI kidney/ureteral stones, GU (genitourinary) malignancy, acid-base balance, volume status, Rhabdomyolysis (the breakdown of muscle tissue that releases a damaging protein into the blood) (Webmd), and response to alkalinization therapy. UA can be divided into three ways: gross inspection, color, and turbidity; dipstick, consists of a series of pads embedded on a reagent strip that provided an assessment of various potential contents of urine; and microscopy, the lab technician will count the amount if WBCs and RBCs and assess them for the presence of bacteria, crystals, and casts.

The steps we took for analyzing the urine samples were inspecting the color of it, and the clarity. Once we've done that, we put on gloves and checked the expiry date on the bottle. We took out three test strips for the three urine

samples, normal urine artificial sample (cup 1, stick 1), abnormal urine-1 artificial sample (cup 2, stick 2), and abnormal urine-2 artificial sample(cup 3, stick 3), and placed each strip into the urine sample. Making sure that all the zones were submerged. Next, we removed the test strip from the sample and took off any excess urine, and place it on a paper towel horizontally to avoid any cross-contamination between the zones.

Each zone has a different amount of time it takes to show the color it corresponds with (e.g. glucose, 30 secs). So after we let it sit for the time each component needed, we documented our results. We compared the colors on the test strip by lining up the strip, once it dried, to the bottle and recorded the findings in a table.

Results/Data

Sample Type	Specific gravity	pH	Glucose	Ketones	Blood	Proteins	Nitrites	Leukocytes	Bilirubin	Urobilinogen
normal urine artificial sample	1.025	6.5	-	Trace 5 mg/dL	-	-	-	-	-	0.2 mg/dL
abnormal urine-1 artificial sample	1.030	6.0	2,000 mg/dL	-	-	100 mg/dL ++	-	-	-	0.2 mg/dL

abnormal urine-2 artificial sample	1.005	8.0	1,000 mg/dL	Trace 5 md/dL	Large +++	300 mg/dL +++	-	-	-	0.2 mg/dL

Discussion/Conclusion

Each of the urine samples tested proved to show different results. Having the normal urine artificial sample was good to compare to the other samples. Doing urinalysis testing, we are able to see first hand how and what a normal urine sample would look like compared to an abnormal urine sample, even if these samples are artificial.

Following along the table, all three samples were within the normal range of specific gravity. For the pH of these samples, they fell within the normal range. As a normal urine sample, there should be no glucose indicated in it. But with abnormal urine sample 1, there are traces of high amounts of glucose in the urine. This indicates that the person could start showing signs of diabetes or already has it due to consuming so much sugar that glucose can not be filtered anymore. Same thing with abnormal sample 2, but with a little less glucose present. In the normal urine sample and abnormal urine sample, there is presence of ketones. Ketones are not normally present, so in order to figure out what this presence means, especially in a normal urine sample, further lab analysis is needed.

In abnormal urine sample 2, there is blood indicated. Since there is a strong indication of blood in urine, this means that the person has hematuria. Abnormal urine samples 1 and 2 both have protein present. Normally, urine does not have proteins in it because the molecules are too big to pass through. So for there to be proteins found,

this could indicate that that person has glomerulonephritis. All three urine samples are tested negative for nitrites, leukocytes, and bilirubin, which is normal. As for urobilinogen, there is a normal level present in urine. Overall, using this simple yet

effective tool, we can see, or get some type of indication, for any abnormalities present in urine and act fast on them before the infection, disease, or condition can completely shut down our urinary system.

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