Urine Analysis

Mallory Dunlap

NYC College of Technology

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Professor Niloufar Haque

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Urine Analysis

In the human body, the urinary system is responsible for the filtration of blood and elimination of waste and metabolic byproducts to leave the body as urine. This system is crucial in its role of regulating blood volume and pressure, ion concentrations in blood, maintaining a stable pH, and reabsorbing nutrients the body needs for metabolism. Additionally, the urinary system assists in removal of toxins that have been processed by the liver. (Martini, pg. 978) Dysfunction of this homeostatic organ by disease will lead to death unless treated.

Urine analysis testing allows for a single urine sample to be evaluated on a number of parameters which give in indication of a person's overall health. Typically, a urine dipstick will test for the presence of organic and inorganic substances, pH, and Specific Gravity. The composition of the urine shows us exactly what is occuring during the nephron filtration, reabsorption, and secretion processes and how effective they are. (Martini, pg 1005) Using a simple urine dipstick can give a clinician an indication of possible conditions such as Diabetes Mellitus, Starvation, Kidney stones, Urinary Tract Infections, Hemolytic Anemia, Hepatitis, Gonorrhea. This test does not always act as a confirmatory test for these conditions but provides valuable information for the provider that there is an underlying pathology that might be accompanying symptoms a patient may be experiencing and prompts them to do further investigation with lab work or diagnostic imaging.In addition to malfunction in the body itself, a urinalysis also serves as a diagnostic test for detection of drugs, microorganisms, and other toxins that might be eliminated from the body. (Martini, pg. 1008) The purpose of this laboratory

exercise is to learn how the Urinalysis works, what it tests, and the significance of these results in regards to an individual's health.

Materials and Methods

Materials for this experiment include the following: normal artificial urine sample and two abnormal artificial samples, urine dipsticks, urinometer, pH paper, test tubes and test tube rack, 10ml graduated cylinder, gloves. First, the physical appearance of the two urine samples will be observed. Physical characteristics of color, transparency, odor were noted. Urine dipsticks were dipped into both the normal and the two abnormal urine samples. Additionally, pH paper was dipped into each sample 2-3 times and note the color after saturation. Lastly, urine from all samples were placed into the urinometer cylinder until filled ⅔ full and measurements were recorded.

Results

	Normal Values	**Standard Urine Specimen**	**Abnormal Urine Specimen 1**	**Abnormal Specimen 2**
Leukocytes	Negative	Negative	Negative	Negative
Nitrates	Negative	Negative	Negative	Negative
Urobilinogen	0.2 or 1 Normal	0.2 Normal	Normal	0.2 Normal
Protein	Negative	Negative	Positive	Positive 2000+
pH	4.5-8	6.0	6.0	8.5
Blood	Negative	Negative	Trace	Positive, Large
Specific Gravity	1.01-1.030	1.015	1.030	1.000
Ketones	Negative	Negative	Positive	Trace

Bilirubin	Negative	Negative	Negative	Negative
Glucose	Negative	Negative	Positive	Positive

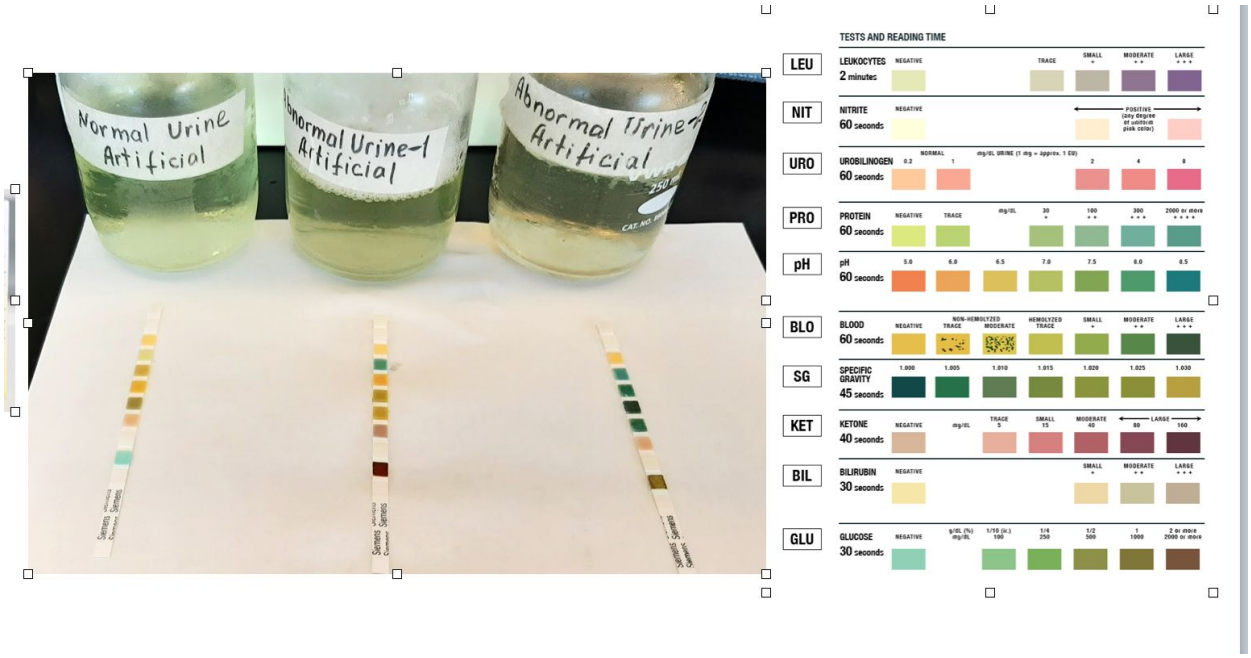

Figure 1. Test strips were performed on 3 specimens; normal artificial urine samples and 2 abnormal samples.

Discussion

The substances measured and their concentration in a urine sample reflect the overall health and functioning of both the kidney and the body at large. Leukocytes indicate the presence of white blood cells or an underlying infection, possibly in the urinary tract. Another possible reason for WBC's to show up positive on a urine analysis is a gonorrheal infection. Nitrates can be indicative of an infection of the urinary tract as a byproduct of one of the most common bacteria that causes Urinary Tract Infections reduces nitrates to form nitrites that may end up in the urine. Proteins under normal circumstances do not filter out from the blood into urine unless

because of certain pathological or non pathological conditions. These conditions cause the glomerular filtration membrane to increase its permeability and allow for larger substances like albumin to pass through. A few of the possible conditions that cause protein to be present in a urine sample are kidney trauma, hypertension, pregnancy, and bacterial toxins.Urine pH normally ranges from 4.5 to 8 with the average at about 6 being slightly acidic. This can change due to many factors including diet, and the presence of a urinary tract infection.Blood, similar to protein, is not normally found in urine due to the size of erythrocytes and their inability to pass through the glomerular filtration membrane. Conditions that affect this membrane, glomerulonephritis and other infections of the kidney or urinary tract can lead to blood in the urine. Specific Gravity is the measure of urine compared to the weight of water. When urine SG measures closer to 1.001 the sample is considered to be very dilute and could mean the individual either is very well hydrated, is taking diuretics, has kidney failure or diabetes insipidus. When the urine sample measures closer to 1.030 this indicates a low water intake, kidney inflammation, Diabetes Mellitus, gonorrhea, or is febrile. Ketones are a result of the body metabolizing fat in excessive amounts creating an acidic environment in the blood. Possible pathologies involved are Diabetes Mellitus, a ketogenic diet with very little consumption of carbohydrates, or starvation. Bilirubin or bile pigments can be found in the urine as a result of liver cirrhosis, hepatitis, or blockage of the bile duct by gallstones. Glucose is not normally found in urine but causes of its presence can include Diabetes Mellitus or excessive intake of carbohydrates. The extremely high blood glucose levels from insufficient insulin production cause the excess to leave in the urine and can sometimes create a “sweet” smell. The presence

of nitrogenous wastes such as uric acid, an acid produced during the breakdown of purines, can indicate Gout or liver disease. (Martini, pg. 1008)

References

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Martini, F., Nath, J. L., & Bartholomew, E. F. (2018). Fundamentals of anatomy & physiology. Harlow, England: Pearson Education Limited.