Ashley Maragh

BIO 2312 OL42

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Professor Niloufar Haque

Urinalysis

Introduction: The urinary system is vital to the human body because it performs several functions that are beneficial for the body. After chemical and mechanical digestion occurs, chemical waste products form as a result. For example, cells create by-products such as water and carbon dioxide when they carry out metabolic processes. Also, urea is formed when excess amino acids are broken down. The main function of the urinary system is to remove these wastes generated by bodily functions. Other than excreting wastes, the urinary system is responsible for stabilizing blood pH, assisting the liver, regulating blood volume, blood pressure, and regulating plasma concentrations of ions. Urine production aids in the process of maintaining homeostasis. Urine consists of urea, creatine, and uric acid. These waste products are dissolved within the bloodstream and only eliminated through urine production. The composition of urine varies because it reflects the filtration, reabsorption, and secretion activities of the nephrons (Marieb et al,. 2016).

On an average day an individual releases a range of 800 ml to 2000 ml of urine. Urine in its natural state, ranges from clear to a pale yellowish color. The yellow pigment that manifests in urine occurs due to urobilin. It has an average pH of 6, indicating that urine is slightly acidic. However, the acidity of urine depends solely on an individual's diet. If an individual has a high protein diet, their urine would be more acidic in comparison to a high vegetable diet. The odor of urine is slightly aromatic due to the presence of ammonia in urea. Although these are the general characteristics of urination, they are subject to change depending on several factors such as your state of hydration, nutrient intake, water intake, and environmental temperature.

Urinalysis, which is the analysis of urine sample, serves as a diagnostic technique that can identify health conditions. It is effective because it indicates illnesses based on the molecules

of which is found in the sample of urine. For example, glucose should not be found in a sample of urine. If glucose is identified in a sample, it may indicate pregnancy or diabetes. Additionally, protein is normally found in urine, but an excess amount of protein can indicate a malfunction within the body. Substantial amounts of protein may indicate damage to the glomerulus. Although urinalysis can detect any complications in an individual's overall health, it is predominantly used to expose renal diseases and urinary tract infections. The urinary test examines the amount of nitrite, ketone, blood, specific gravity, urobilinogen, leukocytes, bilirubin, pH, protein, and glucose that is found in within a sample of urine. The purpose of this experiment was to analyze samples of urine to detect any abnormalities that may indicate health conditions.

Material and Methods: This experiment is divided into two categories in order to analyze the physical and chemical components of urine. To begin the physical component study, we took a physical inventory, noting color, transparency, and odor. Then, we used multistix dipsticks to determine the pH and specific gravity of the three individual urine samples. To analyze the chemical component, we dipped 3 different dipsticks into the three individual tubes of urine. After the dipsticks were put in a paper towel to collect any extra urine, ensuring that the dipsticks do not contaminate the rest of the samples. These dipsticks were then used to detect any abnormalities in the urine sample. Colors on the dipstick can be used to identify the amount of protein, glucose, pH, specific gravity, ketone, bilirubin, urobilinogen, leukocytes, blood, and nitrite that is found in a given sample.

Activity 1: Physical Characteristics

Physical Characteristics	Average Guidelines of Urine Sample	Normal Urine Sample	Patient#1	Patient#2
Color	Transparent/yellow	Transparent/yellow	Pale yellow	Pale amber
Transparency	Clear	Clear	Cloudy/ Turbid	Cloudy
Odor	Aromatic	N/A online	N/A online	N/A online

Activity 2: Chemical Components

Organic Components	Normal urine sample	Patient #1	Patient #2
Glucose	Negative	2000 mg/dL	2000 mg/dL
Bilirubin	Negative	Negative	Negative
Ketone	Negative	5-15 mg/dL (small)	5 mg/dL (small)
Specific Gravity	1.025	1.030	1-1.005
Blood	Negative (yellow)	Hemolyzed trace	Large
pH	6.5	6.0	8-8.5
Protein	negative	2000mg/dL	2000 mg/dL
Urobilinogen	0.2 mg/dL	0.2 mg/dL	0.2 mg/dL
Nitrite	Negative	Negative	Negative
Leukocyte	Negative	Negative	Negative

Discussion: Physical properties and organic components varied in the three urine samples. This data was able to indicate health problems within the patient's body. The urinalysis of the "normal urine sample' indicated that this individual was healthy. Their physical components aligned with the general characteristics of transparency, slightly acidic pH, clear yellowish color and a specific gravity of 1.025. As far as the chemical components, all the 10 reagents were average, meaning there was not excess of any given component. Overall, the "normal urine sample" can be analyzed of the control variable of the experiment.

As far as patient #1 and #2, there were discrepancies in comparison to the general characteristics of urine. For starters, as a part of their physical components, the urine appeared to have turbidity. Turbidity in the urine can possibly indicate an infection of urinary tract, consisting of the kidney, ureters, or bladder. There was also an excess amount of glucose found within the sample indicating that the person is suffering from diabetes or renal damage. Normally, glucose in urine is too low to be detected, so the excess amount is alarming. Additionally, 5-15 mg/dL of ketone was detected in the patient #1's sample, while patient #2 had 5 mg/dL. The normal urine sample should test negative for ketone. The presence of ketone bodies indicates that the kidneys are getting infected which can be a symptom of diabetes. Patient #1 also had a hemolyzed trace of blood within their urine, while patient #2 had a large trace of blood. The trace of blood indicates that there is internal bleeding within the body that is leaking into the urine. This data requires that the patient endure more testing because it may be a sign of kidney damage, bladder cancer, and many other disorders. Lastly, patients #1 and #2 had an excess amount of protein in the liver indicating that the kidney was not working properly. Kidneys normally do not allow an abundance of protein to pass through its filters. Therefore, the excess of kidneys indicate that the kidney is not working effectively. The lack of nitrites and

leukocytes indicate that both patients test negative for urinary infections. Based on the results from the urinalysis of patients #1 and #2, it can be inferred that they suffer from renal glycosuria. According to the *National Organization of Rare Disorders,* "renal glycosuria is a rare condition in which too much of the simple sugar glucose is removed through the urine." This disorder directly aligns with the urinalysis taken for both patients since there was an excess amount of glucose found in both urine samples. Symptoms of renal glycosuria more commonly include extreme thirst and urination. It is diagnosed by urine samples, which they are analyzing if the glucose levels are high or if there are low levels of glucose within the blood. While treatment is not needed for this disease, individuals with renal glycosuria are more prone to developing diabetes mellitus.

Works Cited

Marieb, E. Smith, L. (2018) Human Anatomy & Physiology Laboratory Manual: Fetal Pig Version. 13th Edition.

Lumen Learning (2020). Chapter 13: The Urinary System. *Physical Characteristics of Urine.* Retrieved from https://courses.lumenlearning.com/atd-herkimer-biologyofaging/chapter/physical-characteristics- of-urine/

Rice, J., & Bellcross, C. (2021, November 16). *Renal Glycosuria*. NORD (National Organization for Rare Disorders). Retrieved November 23, 2021, from https://rarediseases.org/rare-diseases/renal-glycosuria/.