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DEPARTEMENT; NURSING DEPARTEMENT

COURSE; PHYSIOLOGY

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QUESTION

Write a short note on the characteristics (and components) of urine.

ANSWERS

Urine is a liquid by product of the body secreted by the kidneys through a process called urination and excreted through the urethra. The normal chemical composition of urine is mainly water content, but it also includes nitrogenous molecules, such as urea, as well as creatinine and other metabolic waste components.

Other substances may be excreted in urine due to injury or infection of the glomeruli of the kidneys, which can alter the ability of the nephron to reabsorb or filter the different components of blood plasma.

* NORMAL CHEMICAL COMPOSITION OF URINE

Urine is an aqueous solution of greater than 95% water, with a minimum of these remaining constituents, in order of decreasing concentration:

* Urea 9.3 g/L.
* Chloride 1.87 g/L.
* Sodium 1.17 g/L.
* Potassium 0.750 g/L.
* Creatinine 0.670 g/L.

Other dissolved ions, inorganic and organic compounds (proteins, hormones, metabolites).

Urine is sterile until it reaches the urethra, where epithelial cells lining the urethra are colonized by facultatively anaerobic gram-negative rods and cocci. Urea is essentially a processed form of ammonia that is non-toxic to mammals, unlike ammonia, which can be highly toxic. It is processed from ammonia and carbon dioxide in the liver.

* Abnormal Types of Urine

There are several conditions that can cause abnormal components to be excreted in urine or present as abnormal characteristics of urine. They are mostly referred to by the suffix -uria. Some of the more common types of abnormal urine include:

Proteinuria—Protein content in urine, often due to leaky or damaged glomeruli.

Oliguria—An abnormally small amount of urine, often due to shock or kidney damage.

Polyuria—An abnormally large amount of urine, often caused by diabetes.

Dysuria—Painful or uncomfortable urination, often from urinary tract infections.

Hematuria—Red blood cells in urine, from infection or injury.

Glycosuria— Glucose in urine, due to excess plasma glucose in diabetes, beyond the amount able to be reabsorbed in the proximal convoluted tubule.

* REGULATION OF URINE COMPOSITION AND VOLUME

Antidiuretic hormone (ADH) is produced by the pituitary gland to control the amount of water that is reabsorbed through the collecting ducts. Urine is produced not only to eliminate many cellular waste products, but also to control the amount of water in the body. In a way, urine volume regulation is part of homeostasis, in that it directly regulates blood volume, because greater amounts of urine will reduce the volume of waters in blood.

* DIURETIC

A diuretic is any substance that has the opposite effect of ADH— they increase urine volume, decrease urine osmolarity, lead to an increased plasma osmolarity, and often reduced blood volume. Many substances can act as diuretics, albeit with different mechanisms.

A common example is alcohol and water ingestion, which directly inhibit ADH secretion in the pituitary gland. Alternatively caffeine is a diuretic because it interferes with sodium reabsorption (reducing the amount of water reabsorbed by sodium cotransport) and increases the glomerular filtration rate by temporarily increasing blood pressure. Many medications are diuretics because they inhibit the ATPase pumps, thus slowing water reabsorption further.

