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CHARACTERISTICS OF URINE

The urinary system’s ability to filter the blood resides in about 2 to 3 million tufts of specialized capillaries, the glomeruli distributed more or less equally between the two kidneys. Because the glomeruli filter the blood based mostly on particle size, large elements like blood cells, platelets, antibodies, and albumen are excluded. The glomerulus is the first part of the nephron, which then continues as a highly specialized tubular structure responsible for creating the final urine composition. All other solutes, such as ions, amino acids, vitamins, and wastes, are filtered to create a filtrate composition very similar to plasma. The glomeruli create about 200 litres of this filtrate every day, yet you excrete less than two litres of wasted urine. Characteristics of the urine change, depending on influences such as water intake, exercise, environmental temperature, nutrient intake and other factors. Some of the characteristics such as colour and odour are rough descriptors of one’s state of hydration. For example, if one exercise or work outside, and sweat a lot, the urine will turn darker and produce a slight odour, even if plenty of water is consumed. It takes time for the kidneys to process body fluids and store it in the bladder. Urine volume varies considerably. The normal range is one to two litres per day. The kidneys must produce a minimum urine volume of about 500mL/day to get rid of wastes in the body. Output below this level may be caused by severe dehydration or renal disease and it is termed **Oliguria**. The virtual absence of urine production is termed **Anuria**. Excessive urine production is termed **Polyuria,** which may be due to diabetes mellitus or diabetes insipidus. In diabetes mellitus, blood glucose levels exceed the number of available sodium-glucose transporters in the kidney, and glucose appears in the urine. The osmotic nature of glucose attracts water, leading to its loss in the urine. In the case of diabetes insipidus, insufficient pituitary antidiuretic hormone (ADH) release or insufficient numbers of ADH receptors in the collecting ducts means that too few water channels are inserted into the cell membranes that line the collecting ducts of the kidney. Insufficient numbers of water channels reduce water absorption, resulting in high volumes of very dilute urine.

NORMAL URINE CHARACTERISTICS VALUES

* Colour Pale yellow to deep amber
* Odour Odourless
* Volume 750-2000mL/24 hours
* pH 4.5-8.0
* Specific gravity 1.003-1.032
* Osmolarity 40-1350 mOsmol/kg
* Urobilinogen 0.2-1.0 mg/100mL
* White blood cells 0-2 HPF (per high-power field of microscope)
* Leukocyte esterase None
* Protein None or trace
* Bilirubin <0.3 mg/100mL
* Ketones None
* Nitrites None
* Blood None
* Glucose None

PHYSICAL CHARACTERISTICS

Physical characteristics that can be applied to urine include: Colour, Turbidity (transparency), Smell (odour), pH (acidity-alkalinity) and density. Many of these characteristics are notable and identifiable by vision alone, but some require laboratory testing.

* Colour: Typically the colour of urine is supposed to be yellow-amber, but it varies according to recent diet and the concentration of the urine. Drinking more water generally tends to reduce the concentration of urine, and therefore causes it to have a lighter colour. Dark urine may indicate dehydration. Red urine may indicate menstruation, red blood cells within the urine, which is a sign of kidney damage and disease. Urine colour is an indicator for hydration. In the urine of a healthy individual, the colour comes primarily from the presence of urobilin.

Urobilin is a final waste product resulting from the breakdown of heme from hemoglobin during the destruction of aging blood cells. Colourless urine indicates over hydration, generally preferable to dehydration (though it can remove essential salts from the body). Colourless urine in drug tests can suggest an attempt to avoid detection of illicit drugs in the bloodstream through over-hydration.

1. Dark yellow urine is often an indication of dehydration.
2. Yellowing/light orange may be caused by removal of excess vitamins B from the blood stream.
3. Certain soda’s such as Fanta can cause orange urine.
4. Bloody urine is termed Hematuria, a symptom of a wide variety of medical conditions.
5. Dark orange to brown urine can be a symptom of jaundice or Gilbert’s syndrome.
6. Black or dark-coloured urine is referred to as Melanuria and may be caused by melanoma or non-melanin.

* Smell (odour): The smell of urine may provide health information. For example, urine of diabetics may have a sweet or fruity odour due to the presence of ketones (organic molecules of a particular structure) or glucose. Generally fresh urine has a mild smell but aged urine has a stronger odour similar to that of ammonia.
* The pH of normal urine is generally in the range of 4.6—8.0, with a typical average being around 6.0. Much of the variation occurs due to diet. For example, high protein diets results in more acidic urine, but vegetarian diets generally result in more alkaline urine (both within the typical range of 4.6—8.0).
* Density: Density is also known as ‘’specific gravity’’. This is the ratio of the weight of a volume of a substance compared with the weight of the same volume of distilled water. The density of normal urine ranges from 0.001 to 0.035.
* Turbidity (transparency): The turbidity of the urine sample is gauged subjectively and reported as clear, slightly cloudy, cloudy, opaque or flocculent. Normally, fresh urine is either clear or very slightly cloudy. Excess turbidity results from the presence of suspended particles in the urine, the cause of which can usually be determined by the results of the microscopic urine sediment examination. Common causes of abnormal turbidity include: increased cells, urinary tract infections or obstructions.

Abnormalities in any of these physical characteristics may indicate disease or metabolic imbalances. These problems may seem superficial or minor on their own, but can actually be the symptoms for more serious diseases, such diabetes mellitus, or a damaged glomerulus.

COMPONENTS OR CONSTITUENTS OF URINE

Normal constituents of urine are:

* Urea: This is the main end product of protein catabolism in mammals. Its excretion is directly proportional to protein intake.
* Ammonia: This is ormed from glutamine or amino acids in acidosis in the kidney. There is a high ammonia output in the urine in diabetes mellitus in which renal function is unimpaired.
* Creatinine and Creatine: Men produce more creatinine than women and children and its excretion is decreased in many pathological conditions such as oedema.
* Uric Acid: This is the end product of purine oxidation in the body. It is not only formed from dietary nucleoprotein but also from the breakdown of cellular nucleoprotein in the body.
* Amino Acids: About 150—200mg of amino acid nitrogen is excreted in the urine of adults in 24 hours.

Also found in urine are sodium, potassium, chloride and other dissolved ions, inorganic and organic compounds (proteins, hormones, metabolites).