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CHARACTERISTICS AND COMPONENTS OF URINE.

Physical Characteristics

Physical characteristics that can be applied to urine include color, turbidity (transparency), smell (odor), pH (acidity – alkalinity) and density. Many of these characteristics are notable and identifiable by vision alone, but some require laboratory testing.

1. Color: Typically yellow-amber, but 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 color. Dark urine may indicate dehydration. Red urine indicates red blood cells within the urine, a sign of kidney damage and disease.
2. Smell: The smell of urine may provide health information. For example, urine of diabetics may have a sweet or fruity odor 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 odor similar to that of ammonia.
3. The pH of normal urine is generally in the range 4.6 – 8, with a typical average being around 6.0. Much of the variation occurs due to diet. For example, high protein diets result in more acidic urine, but vegetarian diets generally result in more alkaline urine (both within the typical range of 4.6 – 8).

4. 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.
5. Turbidity: 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 of 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 as diabetes mellitus, or a damaged glomerulus.

Components of Urine

Human urine consists primarily of water (91% to 96%), with organic solutes including urea, creatinine, uric acid, and trace amounts of enzymes, carbohydrates, hormones, fatty acids, pigments, and mucins, and inorganic ions such as sodium (Na⁺), potassium (K⁺), chloride (Cl⁻), magnesium (Mg²⁺), calcium (Ca²⁺), ammonium (NH₄⁺), sulfates (SO₄²⁻), and phosphates (e.g., PO₄³⁻). A Representative Chemical Composition of Urine:

1. Water (H₂O): 95%
2. Urea : 9.3 g/l to 23.3 g/l
3. Chloride (Cl⁻): 1.87 g/l to 8.4 g/l
4. Sodium (Na⁺): 1.17 g/l to 4.39 g/l
5. Potassium (K⁺): 0.750 g/l to 2.61 g/l

6. Creatinine: 0.670 g/l to 2.15 g/l

7. Inorganic sulfur (S): 0.163 to 1.80 g/l

Lesser amounts of other ions and compounds are present, including hippuric acid, phosphorus, citric acid, glucuronic acid, ammonia, and uric acid.

Chemical Elements in Human Urine

The element abundance depends on diet, health, and hydration level, but human urine consists of approximately:

Oxygen (O): 8.25 g/l

Nitrogen (N): 8/12 g/l

Carbon (C): 6.87 g/l

Hydrogen (H): 1.51 g/l