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characteristics (and components) of urine

Characteristics of a healthy urine specimen

Color

The color of urine is determined mostly by the breakdown products of red blood cell destruction (Figure 2). The "heme" of hemoglobin is converted by the liver into water-soluble forms that can be excreted into the bile and indirectly into the urine. This yellow pigment is **urochrome**. Urine color may also be affected by certain foods like beets, berries, and fava beans, and certain medications. Dehydration produces darker, concentrated urine.

Specific gravity

Specific gravity is an easy way to estimate the osmolarity of a urine sample. The specific gravity of urine is a ratio of the density of a urine specimen to water. The density of water is 1.000 g/ml. Because urine samples always contain solutes, even a urine sample that is very pale in color will have a density that is slightly higher than water. The urine sample of a dehydrated person will be darker in color, and will have a density that is substantially higher than water, as it will contain a great deal of solutes. As a result, the specific gravity of a well-hydrated individual's urine will be roughly 1.003, whereas the specific gravity of a dehydrated individual's urine will be closer to 1.032.

Odor

Fresh urine often has very little odor. Most of the ammonia produced from protein breakdown is converted into urea by the liver, so ammonia is rarely detected in fresh urine. The strong ammonia odor you may detect in bathrooms or alleys is due to the breakdown of urea into ammonia by bacteria in the environment

pH

The pH (hydrogen ion concentration) of the urine can vary more than 1000-fold, from a normal low of 4.5 to a maximum of 8.0. A urine specimen is typically slightly acidic with a pH of roughly 6.0, but pH can vary substantially with an individual's diet.

Urine volume

Urine volume varies considerably. The normal range is one to two liters per day. The kidneys must produce a minimum urine volume of about 500 mL/day to rid the body of wastes. Output below this level may be caused by severe dehydration or renal disease and is termed **oliguria**. The virtual absence of urine production is termed **anuria**. Excessive urine production is **polyuria.**.

The composition of urine is related to the current composition of the blood, and the current regulation of nephrons

Typical constituents of filtrate and urine

All typical blood components able to pass through the filtration membrane, such as ions, glucose, amino acids, vitamins, hormones, and wastes create a filtrate composition very similar to plasma, but missing large and negatively charged molecules. The glomeruli create about 180 liters of this filtrate every day, yet you excrete less than two liters of waste you call urine. The nephron tubules are responsible for returning the vast majority of needed constituents to the blood. The actual constituents in the final urine depend highly, and represent a concentrated solution of both waste and excess nutrients.

Urine Composition

Over 99 percent of urinary solutes are composed of only 68 chemicals which have a concentration of 10 mg/L or more. 42 compounds are actually involved. They may be classified as follows:

- Electrolytes such as sodium, potassium, calcium, magnesium and chloride
- Nitrogenous chemicals such as urea and creatinine
- Vitamins
- Hormones
- Organic acids such as uric acid
- Other organic compounds