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Characteristics and components of urine

- Urine, a typically sterile liquid by-product of the body, is secreted by the kidneys through a process called urination and excreted through the urethra.
 - **Physical characteristics of urine**
- ✓ **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.

Red urine ---- red blood cells within the urine, a sign of kidney damage and disease

Dark yellow urine ---- indicative of dehydration.

Yellowing/light orange-----caused by removal of excess B vitamins from the bloodstream.

Bloody urine ----- hematuria, a symptom of a wide variety of medical conditions.

Dark orange to brown urine ----- symptom of jaundice, rhabdomyolysis, or Gilbert's syndrome.

Black or dark-colored urine -----Mel anuria and may be caused by a melanoma or non-melanin acute intermittent porphyria.

- ✓ **PH:** 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).
- ✓ **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.
- ✓ **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.

- ✓ **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
- ✓ **Urine osmolality:** is a measure of **urine** concentration, in which large values indicate concentrated urine and small values indicate diluted urine. Consumption of water (including water contained in food) affects the osmolality of urine. It can range from approximately 50 to 1200 mOsm/kg.
- ✓ **Urobilinogen:** is formed from the reduction of bilirubin, urobilinogen is normally present in the urine in low concentrations (0.2-1.0 mg/dL or <17 micromol/L).
- ✓ The normal range for 24-hour urine volume is 800 to 2,000 **milliliters** per day (with a normal fluid intake of about 2 **liters** per day).
- ✓ White blood cells 0–2 HPF (per high-power field of microscope)
- ✓ Leukocyte esterase None
- ✓ Protein None or trace
- ✓ Bilirubin <0.3 mg/100 mL
- ✓ Ketones None
- ✓ Nitrites None
- ✓ Blood None
- ✓ Glucose None

Chemical Composition of Urine

Normal urine consists of water, urea, salts, and pigments.

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.

Water (H₂O): 95%

Urea (H₂NCONH₂): 9.3 g/l to 23.3 g/l

Chloride (Cl⁻): 1.87 g/l to 8.4 g/l

Sodium (Na⁺): 1.17 g/l to 4.39 g/l

Potassium (K⁺): 0.750 g/l to 2.61 g/l

Creatinine (C₄H₇N₃O): 0.670 g/l to 2.15 g/l

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

Calcium	0.015
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Magnesium	0.01
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Phosphate	0.12s
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Ammonia	0.05
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Uric acid	0.03
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