

# Assessing Urinary Function: The Urinalysis

[\*\[Entire Lab based on Section 25.1: Physical Characteristics of Urine\]\*](#)

[\*\[Table 25.1: Normal Urine Characteristics\]\*](#)

[\*\[Table 25.2: Urine Volumes\]\*](#)

## Urine Composition

- Water accounts for about 95% of the volume of urine
- The other 5% is excess vitamins, drugs, electrolytes, and nitrogenous wastes
- Abnormal substances in the urine can be detected by **urinalysis**

## Physical and Chemical Analysis of Urine

- The average pH of urine is 6.0, it can range b/n 4.5 and 8.0.
- Vegetarians have a pH above 7.0
- High-protein diets yield an acidic pH, below 7.0
- Concentration of urine has traditionally been measured as specific gravity. Specific gravity is a way of comparing the weight of one fluid (like urine in this case) to the weight of a reference fluid (pure, distilled water). The specific gravity of urine is between 1.003 and 1.030.
- It is more common now for labs to measure concentration in osmolarity. The reference range for urine is around 100 – 1200 mOsmol/L.
- Drinking lots of fluids, lowers the specific gravity (makes it more dilute). Taking in less fluids increases specific gravity (makes it more concentrated).
- Excessively concentrated urine results in crystallization of solutes, usually salts, into insoluble kidney stones

## Physical and Chemical Analysis of Urine

Certain materials in urine suggest renal disease, injury, or other pathological conditions:

- ***Ketonuria*** (ketones in urine) – observed in the urine in the event of starvation, diabetes or a low carb diet. Fat catabolism produces fatty acids. The liver cells convert excess fatty acids to ketones
- ***Glycosuria*** (glucose in urine) - indicates diabetes or stress
- ***Albuminuria*** (albumin in urine) - suggest an increase in permeability of glomerular membrane. May be due to injury, high blood pressure, disease, bacterial toxins
- ***Hematuria*** (RBCs or whole blood in urine) - indicates bleeding caused by inflammation or infection of urinary tract. Kidney stones, trauma, menstruation or tumor formation
- ***Pyuria*** (WBCs in urine) - urinary tract infection

- ***Bilirubinuria*** (bilirubin in urine) - result of the breakdown of hemoglobin from old RBCs being removed from the circulatory system by phagocytic cells in the liver.
- ***Urobilinogenuria*** (urobilinogen is produced by the breakdown of bilirubin) - may indicate hepatitis, cirrhosis, congestive heart failure, or other diseases

### **Lab Activities—Urinalysis**

Simulated Urinalysis with artificial urine samples

### **Learning Objectives**

- To list the physical characteristics of urine
- To identify the normal pH and specific gravity ranges of urine
- To identify different substances that can appear in the urine using simple chemical tests
- To define the following terms and describe their meaning with respect to urinalysis
  - Calculi / casts
  - Glycosuria / albuminuria / ketonuria / hematuria / hemoglobinuria / pyuria
- To describe possible causes of the above defined conditions