



Determenation of serum
ascorbic acid

Ascorbic Acid (Vitamin C)

Ascorbic acid commonly known as vitamin C, is a water-soluble vitamin essential for various physiological functions in the body. It serves as a powerful antioxidant, a cofactor for enzymatic reactions, and plays a key role in immune function and collagen synthesis.

Chemical Structure

- Structure: A six-carbon lactone with hydroxyl groups that allow it to act as a reducing agent.

It exists in two forms:

- 1) L-ascorbic acid (biologically active form)
- 2) D-ascorbic acid (oxidized form, which can be reduced back to ascorbic acid in the body)

Biosynthesis

- ❖ Some lower mammals like rats can synthesize the vitamin from glucose by the **uronic acid pathway**.
- ❖ Man, monkey and guinea pigs lack the enzymes necessary for the synthesis. They cannot convert ketogulonolactone to ascorbic acid. Hence the entire human requirement **must consequently be supplied by the diet**.

Metabolism: Absorption, distribution and excretion

- ❖ It is **absorbed** readily from the small intestine, peritoneum and subcutaneous tissues.
- ❖ It is widely **distributed** throughout the body. Some tissues contain high concentrations as compared to others. Local concentration roughly parallels the metabolic activity
- ❖ From maternal blood, it can cross the placental barrier and supplies the fetus.

- ❖ Normal human blood plasma: It contains approx. **0.6 to 1.5 mg** of ascorbic acid per 100 ml.
- ❖ The vitamin exists in the body largely in the **reduced form** with reversible equilibrium with a relatively small amount of dehydro-ascorbic acid (oxidized form).
Both forms are physiologically and metabolically active.

Considerable amount of vitamin C activity is lost during **cooking, processing and storage**, because of its water-solubility and its irreversible oxidative degradation to inactive compounds.

Recommended Daily Intake

- **Adults:**
- **Men:** 90 mg/day
- **Women:** 75 mg/day
- **Higher needs:** Pregnant/lactating women, smokers, and individuals under stress or with infections.

Biological Functions

- **Antioxidant:** Protects cells from oxidative damage by neutralizing free radicals.
- **Collagen Synthesis:** Required for hydroxylation of proline and lysine residues in collagen formation, essential for wound healing and maintaining connective tissues.
- **Iron Absorption:** Enhances the absorption of non-heme iron from plant-based foods.

- **Neurotransmitter Production:** Involved in the biosynthesis of dopamine, norepinephrine, and serotonin.
- **Immune Function:** Enhances white blood cell function and supports the body's defense against infections.
- **Carnitine Synthesis:** Plays a role in energy metabolism by aiding in the synthesis of carnitine, which transports fatty acids into mitochondria for energy production.

Measurement

Measuring serum ascorbic acid levels is important in diagnosing deficiencies or monitoring supplementation. This is especially relevant in conditions like scurvy, malnutrition, or diseases where oxidative stress is a concern.

Methods of Measurement

- spectrophotometric assays
- high-performance liquid chromatography (HPLC)
- electrochemical assay

Deficiency (Scurvy)

A deficiency in vitamin C leads to scurvy, characterized by:

- Fatigue and weakness
- Swollen, bleeding gums
- Poor wound healing
- Joint pain
- Small red or purple spots on the skin
- Anemia due to decreased iron absorption
- Depression and irritability

Thank you

