VITAMIN C

Vitamin C

- Ascorbic acid
- Water-soluble
- Vitamin C is synthesized using glucose in some animals.
- Some mammals synthesize vitamin C in liver.
- However, in humans, ascorbic acid can not be synthesized due to the inactivation of a gene (L-gulonolactone oxidase) responsible for the last step of ascorbic acid biosynthesis from glucose.

Vitamin C

- Vitamin C acts as an electron transporter, so the most important effect is the antioxidant effect.
- Vitamin C presents in gastric liquid at higher level than in plasma.
- It is thought that it can prevent the formation of N-nitroso compounds which are known for their mutagenic effect.
- High doses of vitamin C have been reported to reduce the risk of stomach cancer.

Vitamin C

- Vitamin C content in a food is variable.
- It is decomposed by heating.
- It is affected by seasonal changes, storage and transport conditions, cooking processes, chlorine in water used for cooking, cutting and shredding.
- Cutting and shredding releases ascorbate oxidases, causing degradation of vitamin C.

Vitamin C

- Heating, exposure to copper and iron ions or alkaline medium cause degradation of vitamin C.
- Cooking with excess water causes it to come out of the tissues.
- Decolorization process inactivates oxidases and provides preservation of vitamin C.
- Medium at low pH prevents the degredation of vitamin C.

Vitamin C is decomposed very quickly. For minimum loss of vitamin C, it is recommended;

- To consume fresh vegetables and fruits during the season,
- To store food in the refrigerator and consume it in a short time,
- To wash fresh food quickly with little water instead of keeping it in water,
- To cook with minimum water without multiple cutting operations,
- Not to use iron or copper containers,
- To cook frozen foods without thawing.

Vitamin C

- The richest source is potatoe.
- During storage of potatoes, the average vitamin C content of 30 mg/100 g decreases to about 8 mg/100 g, but even this amount is sufficient for daily intake.

Vitamin C Need of the Body

- The lowest dose is 10-20 mg/day to avoid the symptoms of vitamin C deficiency. As a result of daily intake at the dose of 25-35 mg and above, plasma concentration starts increasing and it is used for metabolic needs.
- Smoking, oral contraceptives, steroids, excessive alcohol consumption, and analgesics increase the need for this vitamin
- In case of infection and physical trauma, the amount of circulating leukocytes increases and these cells use vitamin C in plasma.
- Low plasma concentration of vitamin C is determined in diabetic and infectious patients and smokers.
- Excessive vitamin C is not stored in the body.

Recommended Daily Dose

Age	mg/day
0-6 months	25
7-12 months	30
1-3 months	30
4-6	30
7-9	35
10-18	40
19-65	45
65 +	45
Pregnancy	55
Lactation	70

Deficiency of Vitamin C

- One of the most common conditions seen in vitamin C deficiency is anemia.
- Because of the antioxidant effect of vitamin C, it is thought to prevent the oxidation of folic acid in blood production.
- In case of vitamin C deficiency, folic acid is oxidized and excreted and the absorbtion of iron which is taken by daily diet decreases. This conditions cause anemia.

Deficiency of Vitamin C

- Weight and teeth loss
- Fatigue and joint pain
- Scurvy (bruising easily, bleeding gums, and tendency for bones to fracture)
- Reduced resistance to colds and infections
- Slow healing of wounds

Function of Vitamin C

- It is necessary for the metabolism of fats, cholesterol, certain proteins, especially tyrosine; for the production of adrenaline and dopamine, for production of tryptophan and seratonin neurotransmitters, to increase folic acid metabolization and iron absorption.
- Required for production of collagen.

  Collagen is the most common protein in our body, necessary for the construction of blood vessels, skin, muscle, bone, teeth, joints, and various organs, for tissue regeneration and for the repair of damage such as cuts and abrasions.

Function of Vitamin C

- It supports the immune system via different mechanisms;
  - *Promotes the production of lymphocytes and antibodies which are involved in the defense mechanism against infections*
  - *Enhances the function of immune system cells, phagocytes which destroy bacteria and foreign substances.*
  - *Supports the functions of the thymus gland, which plays a key role in the immune system.*

Function of Vitamin C

- Essential for dentin production in teeth and calcification which is the process of providing hardness of bones.
- Exhibits strong antioxidant activity.
- Prevents the signs of aging and cell death.
- Protective effect against cancer and some other diseases.

Function of Vitamin C

- Although vitamin C intake is known to reduce the risk of cancer of the oral cavity, esophagus, stomach, colon and lung; diseases such as cancer, heart disease and cataracts are not directly related to vitamin C.

Vitamin C Intake at High Doses

- The results of the studies are variable.
- Many studies suggest that 500 mg/day is the optimum dose for vitamin C intake.
- There are studies suggesting a prolonged life span of approximately 6 years in case of vitamin C intake at the dose of 300 mg/day.
- In studies conducted on healthy individuals, it was found that serum concentration did not increase when taken above 200 mg daily.

Use of Vitamin C

- Most common use at high dose is in case of cold an flu.
- The recommended dose is 1000 mg/day or above this dose.
- If vitamin C intake at this dose is started when the first symptoms are seen, it is reported that the duration of cold or flu shortens.

Use of Vitamin C

- There is an association between low vitamin C intake and cancer risk.
- It has been found that daily diet comprising abundant vegetables and fruit reduces the risk of death in cancer patients.
- The life span of cancer patients is prolonged by up to 80% with the use of vitamin C (12000 mg) and other vitamins at high doses.
- It reduces the risk of skin cancer when applied on the skin.

Use of Vitamin C

- Vitamin C increases the efficacy of chemotherapy in cancer, while it reduces the damage caused by radiotherapy in healthy tissues.
- Vitamin C is known to have protective effects against factor causing cancer.
  - *Protective against benzopyrene in cigarette smoke*
  - *Prevents the formation of nitrosamines from nitrite and nitrate found in meat and some foods*

Use of Vitamin C

- Intake of vitamin C at high doses reduce the risk of heart attack and stroke.
- Low doses of vitamin C cause an increase in blood pressure, which is a major risk factor for heart attack and stroke.
- Around 200 mg/day of vitamin C provides a significant decrease in blood pressure in patients with moderate hypertension.

Use of Vitamin C

- The use of vitamin C at the dose of 500-1000 mg causes an increase at HDL and a decrease in LDL levels .
- It prevents arteriosclerosis by protecting the blood vessels against free radical damage.

Use of Vitamin C

- In patients with diabetes, the amount of vitamin C in the blood was found to be low even if taken in sufficient amounts.
- The daily use of vitamin C at a dose of 500-1000 mg improves blood-glucose levels.
- Vitamin C concentration is 20 times higher in the eye than that in the blood.

  Patients receiving vitamin C at high doses (500-1000 mg) have a much lower risk of developing cataracts and age-related eye diseases.

Use of Vitamin C

- Daily intake of vitamin C around 3000 mg (1000 mg X 3) reduces asthma symptoms in adults. The effect is thought to be due to its antioxidant properties.
- It was found that taking 2000 mg of vitamin C before exercise reduces the risk of exercise-induced asthma attacks.
- High levels of vitamin C in the blood have been found to reduce the incidence of bronchitis and other lung diseases.

Use of Vitamin C

- Intake at the dose of 1000 mg X3 daily accelerates wound healing.
- It has been found to be a prophylactic or therapeutic aid against arthritis, Parkinson's disease, gum disease, mouth sores, chronic fatigue and gallstones.
- It is generally recommended to be used at the dose of 500-1000 mg/day.

Adverse Effects and Cautions

- In case of use at high doses, gastrointestinal system disorders such as stomach cramps, diarrhea, gas and indigestion may be seen. In this case, it is recommended to reduce to the dose of 1000 mg or less.
- It exhibits diuretic effetc at high doses and causes excessive urine excretion.
- It may show prooxidant activity at high dose, so it causes oxidation.

Adverse Effects and Cautions

- It may cause false positive results at the test for diabetes.
- It may cause some changes at the hemoglobin levels in blood test results.
- People with kidney stones should be careful when taken above 1000 mg, it may cause stone formation.
- High doses should not be used during pregnancy.