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## Role of calcium in our body

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### Abstract

Calcium is a major element in our body and an adult man of 60 Kg has nearly one kilogram of calcium. The rest is distributed in blood and soft tissues, such as muscles, the liver and the heart. Skeletal fragility at the end of the life span (Osteoporosis) is a major source of morbidity and mortality. Adequate calcium intake from childhood to the end of the life span is critical for the formation and retention of a healthy skeleton. Low calcium intake has been implicated in the development of hypertension, colon cancer, and premenstrual syndrome and it is associated with low intakes of many other nutrients. Encouragement of increased consumption of calcium-rich foods has the potential to be a cost-effective strategy for reducing fracture incidence later in life and for increasing patients' dietary quality and overall health.

**Keywords:** Bone, osteoporosis, blood pressure, dietary recommendations, cancer

### Introduction

Calcium is an essential element with the symbol Ca. It is discovered by Sir Humphrey Davy in 1808 in England. It is derived from the Latin word “*Calx*” meaning “*lime*”. Calcium is a major element in the body and an adult man of 60 Kg has nearly one kilogram of calcium. Almost 99 per cent of this calcium is found in the hard tissues of the body-namely the bones and teeth. The rest is distributed in blood and soft tissues, such as muscles, the liver and the heart. Most health professionals would agree that sufficient calcium intake is necessary for good health throughout life. Calcium is also a threshold nutrient that is below the threshold level, an increase in dietary calcium intake results in an improved response. In bone, calcium provides the structural strength that allows the bone to support the body's weight and anchor the muscles. Bone calcium also serves as a reservoir that can be tapped to maintain extracellular calcium concentration regardless of intake. Thus, the effects of calcium deficiency may manifest as skeletal weakness or fractures. Calcium is involved in the reducing risk of osteoporosis, hypertension, colon cancer, breast cancer, kidney stones and lead intoxication.

Low consumption of milk and other dairy foods is the primary reason that large percentages of the US population are failing to meet their calcium needs. The use of calcium supplements and calcium-fortified foods may help to alleviate inadequate intakes of calcium from dairy foods, but these additional sources fail to deal with the real problem in the US, which is poor dietary patterns of food selection. Diets low in calcium are low in many other essential nutrients. The reason for this is that calcium-rich dairy foods also supply 31% of the riboflavin, 20% of the protein, 19% of the zinc, 18.5% of the potassium, 17% of the vitamin A, 16% of the magnesium and 10% of the vitamin B6 to the food supply while providing only 12% of the fat and 9% of the energy. The results of several research studies have demonstrated that it is possible to meet current recommendations for calcium intake through foods without increasing fat or calorie intake, without excessive weight gain and without negatively impacting on blood lipids, while improving the nutritional quality of the diet. For this reason, health professionals recommend that we meet our calcium needs through foods first. Continuing education of consumers will be needed to overcome the current deficit of calcium in the US diet and reduce the risk of related chronic diseases.

### Proportions

The body contains about 2% of Ca and 98% of this is in the bones. The cell and body fluid contains from 10-15 gm per 100 gm.

The blood Ca is in two distinct forms, a part is bound with protein and is non diffusible while the diffusible moiety is found as dissociated phosphates and carbonates and as ionic calcium. The protein bound Ca does not diffuse. Out of the blood, the cerebrospinal fluid contains only 6 mg per 100 gm. The Ca in the blood and tissues and that in the skeleton are in equilibrium. The Ca of the bone can be drawn upon to make up deficiency of blood Ca and when the deficit is made up the Ca is redeposited in the bone. The medication of parathyroid is necessary for the withdrawal of Ca from the skeleton. In the body, there is a balance in various forms of Ca. The ionic forms of Ca is involved in the various physiological activities.

### Physiological role

Daily body requirement is about 450 mg. The adult requirements of Ca vary. During pregnancy and lactation, there is greater depletion of Ca from the mother and the intake needs to be increased. On an average, 10 mg per Kg of body weight per day should be sufficient. Growing children would require from 40 to 60 mg per day.

According to the U.K. Dept. of Health recommended reference nutrients intake for Ca required according to age.

The infants and children require 350 - 550 mg/day. Teenage girls and boys: 800 – 1000 mg/day, adult men and women: 700 mg/day.

The Calcium plays an important role to maintain some important body functions such as:

1. Ca controls nerve excitability. The effect is mainly on the peripheral neuromuscular mechanism. Fibrillary twitching can be produced by per fusing a muscle with Ca free fluid. Automatic ganglia also become hyper irritable.
2. It is necessary for the maintenance of the integrity of the skeletal muscles. An increase in the ionized Ca results in an increase in contractility and vice versa.
3. It is very essential for maintaining the tone and contractility of heart. Ca is antidotal to the depressant action of K.
4. It aids rennin in the coagulation of milk in the stomach.
5. Calcium take part in the formation of certain tissue and bones. Normally 25-35% is excreted in the urine and the rest in the stools.

### Calcium Deficiency

Calcium deficiency is a condition in which the body has an inadequate amount of calcium. Calcium is a mineral that is essential for many aspects of health, including the health of bones and teeth, and a normal heart rhythm. This mineral is also required for muscle contractions and relaxation, nerve and hormone function, and blood pressure regulation.

Calcium must be ingested daily and absorbed effectively in order to maintain optimal health.

### Types of calcium deficiency

There are two types of calcium deficiency

Dietary calcium deficiency is a condition in which there is an inadequate calcium intake, which can lead to depleted calcium stores in the bones, thinning and weakening of the bones, and osteoporosis.

Hypocalcaemia is a low level of calcium in the blood. It can occur from taking medications, such as diuretics; medical treatments; or disease processes, such as renal failure or hypoparathyroidism. An insufficient amount of calcium in your diet will generally not cause hypocalcaemia. This is because normal amounts of calcium in the blood are so critical to

many vital body functions of the nerves, muscles, brain and heart, that your body will pull calcium from the bones as needed to maintain normal blood calcium levels. This enables important processes in the body to continue. Untreated calcium deficiency can lead to serious complications, such as osteoporosis, hypertension and cardiac arrhythmias and follow your treatment plan to reduce the risk of serious complications from calcium deficiency. If you, or someone you are with, have chest pain a seizure, difficulty breathing, or an unusual change in alertness or consciousness.

### Sign of Deficiency in Calcium

All humans lose bone density starting between the ages of 30 and 40. Excessive bone loss affects over 20 million people, mostly women who are 45 and older.

#### Sign no. 1: Muscle Cramping

One of the first signs of a deficiency is a nervous affliction called tetany, which is characterized by muscle cramps, numbness and tingling in the arms and legs. These types of cramps generally occur at night, especially in the legs.

#### Sign no. 2: Dry Skin and Brittle Nails

A common calcium deficiency sign can be seen in your skin and your nails. When your skin becomes dry and your fingernails become brittle (break easily), you could be lacking from calcium

#### Sign no. 3: Increased PMS Symptoms

A woman may begin experience more cramping or a change in her menstrual flow if she is suffering from a calcium deficiency. Adding more calcium to a diet may ease these symptoms.

#### Sign no. 4: Bone Fractures or Breakage

If you begin to suffer from several small bone fractures or full bone breakage, you should really evaluate the amount of calcium in your diet. This is a severe symptom of calcium deficiency.

### Bone

Bone is continually being remodelled, with osteoclasts resorbing bone and osteoblasts replacing the absorbed bone. In general, these 2 processes are in equilibrium. Bone remodelling serves to repair microdamage and to allow bone to respond and adapt to mechanical stress.

If the bone remodelling rate increases, the remodelling space increases and total bone mineral content decreases. If the bone remodelling rate decreases, the opposite happens. Estrogen, the calciotropic hormones, and dietary calcium intake have substantial effects on the bone remodelling rate, as do such pharmacologic agents as bisphosphonates. In the mature adult, bone formation often does not replace 100% of the resorbed bone.

For example, the number of osteoblasts decreases with age, whereas low estrogen level and low dietary calcium intake both increase osteoclast formation. Low estrogen concentration also increases the depth of the resorption cavity, which can lead to perforation and disconnection of trabeculae.

### Osteoporosis

Osteoporosis is characterized by bone fragility such that fractures can occur under conditions of minimal trauma, including the normal stresses of living. Osteoporosis is generally a disease of older adults because the cumulative

effects of slow bone mineral loss take time to deplete the skeleton.

### **Conclusion**

Through these various biological roles and other mechanisms calcium is involved in reducing the risk of osteoporosis, hypertension, colon cancer, breast cancer, kidney stones and lead intoxication. A good accumulation of calcium in the bones at early stages in life is the best prevention of age-related bone loss and fractures. It is important for vegans to include adequate amounts of non-dairy sources of calcium in their daily diet. It is more efficient to take calcium in smaller doses several times a day and at night before bedtime, which also promotes a sound sleep. The key is prevention and prompt diagnosis. Consult your nutritionist or dietitian to plan your diet accordingly. Always take away from tannin rich beverages, to help ensure maximum absorption. When there is not enough calcium absorbed in the body, the output of estrogen decreases. As is the case with postmenopausal women, older men are often deficient in calcium. Even it also can be encourages moderate exercise. Although dairy products are the main source of calcium in the diet, other foods also contribute to overall calcium intake. Calcium is also used in muscle contraction, blood clotting, and maintenance of cell membranes. Long-term calcium deficiency can lead to osteoporosis, in which it is remarkable that there should be so much controversy over the roles of calcium and vitamin D in human nutrition in general and in osteoporosis in particular, given that both are acknowledged to be essential nutrients.

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