

# A Revisit to the Fascinating World of Vitamin D

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**V**ARIOUS scientific investigations have demonstrated that Vitamin D is much more essential for the appropriate functioning of the human body and wellbeing than previously believed, and consequently, it has become a hot topic of research these days. Due to its multitask role in human health, vitamin D is widely attracting the attention of researchers, food technologists, regulatory agencies, and advisory bodies worldwide these days. Initially, vitamin D was known to have a pivotal role in calcium and phosphorous metabolism, and therefore, essential for bone health. Its deficiency was found responsible for classic deficiency disease rickets in children, and osteomalacia in adults. In rickets, children develop deformities of the skeleton, such as bowed legs, misshapen pelvis, enlarged head, prominent knobby projections along the ribs, curvature of the spine, poor teeth, and flabby legs. Osteomalacia is characterised by extreme softness of bones, muscle pain and weakness. The devastating disease, rickets also retard the growth of children and carries the risk of upper respiratory-tract infections including tuberculosis and influenza.

It has also been discovered that vitamin D is essential for maintaining the health of every system and cell in the human body's intricate machinery. Vitamin D is now, regarded as vital to heart and brain health, for example, as it is to bone health. It has been found to prevent and treat a large number of ailments, such as high blood pressure, back pain, diabetes,

arthritis, infectious diseases, fibromyalgia, cancer, etc. Despite the numerous reports of the association of vitamin D with a spectrum of development, disease treatment, and health maintenance, vitamin D deficiency is common.

World Health Organisation (WHO) recognised vitamin D as a global health issue. In a statement on vitamin D insufficiency, the World Medical Association (WMA) also stated that vitamin D deficiency is a prominent health problem across the world and about one-third of the population is estimated to have a serum concentration of vitamin D lower than required.

Vitamin D is a fat-soluble vitamin produced endogenously when ultraviolet-B (UV-B) rays present in sunlight strike human skin and trigger its synthesis. It is present naturally in a few foods. Vitamin D is also referred to as calciferol or sunshine vitamin. It is primarily stored in adipose tissues of the human body (half-life, about 2 months). There are several forms of vitamin D, but it mainly exists in two forms-vitamin D<sub>2</sub> (ergocalciferol) and vitamin D<sub>3</sub> (cholecalciferol). These two forms are almost similar in their structures and physiological activities.

Therefore, the term "vitamin D" implies vitamin D<sub>2</sub> or vitamin D<sub>3</sub> or both. Vitamin D is physiologically inactive in its original state. Its activation takes place

only when it enters the liver and kidneys by blood circulation. In the liver, vitamin D is metabolised to 25-hydroxyvitamin D [25(OH)D] or calcidiol while in the kidneys, it is metabolised to 1,25-dihydroxyvitamin D [25(OH)<sub>2</sub>D] or calcitriol. Due to the greater stability (longer half-life, about 15 days) of 25-hydroxyvitamin D, its quantity is used to estimate the amount of vitamin D in the blood. The physiologically active form of vitamin D is 1,25-hydroxyvitamin D. It acts as a hormone and modulates and regulates a vast array of biologically significant reactions in the human body.

Though vitamin D is called a vitamin, but if its formation in human skin under the influence of sunlight and its physiological action are taken into account, technically, it is a hormone. It may be noted that vitamins are organic compounds which cannot be synthesised by the human body but are necessary for its proper functioning and health. These are obtained from dietary sources only. On the other hand, hormones are substances synthesised in the body from simple precursors and then transported by the bloodstream to a target organ where they perform a specific biological function. Hormones are more sophisticated complex molecules than vitamins.

Sunlight exposure is a primary source of vitamin D. As stated earlier, a chemical compound, 7-dehydrocholesterol present in human skin undergoes photochemical conversion into vitamin D<sub>3</sub> form of vitamin D in the presence of UV-B