

VITAMIN D: ALMOST TOO GOOD TO BE TRUE

INTRODUCTION: Vitamin D has been in the medical news lately. It is a hot topic. Gradually, evidence has been accumulating that it does more than potentiate the mineralization of bone. The following is a summary of a lecture given by the foremost authority on Vitamin D, Michael Holick, M.D. Ph.D. of Boston University.

DESCRIPTION: Vitamin D, so named because it was the fourth vitamin discovered, is a complex ringed structure. It is made in the human skin from Ultraviolet B light acting on cholesterol. That is the same spectrum of light that causes sunburn. The substance thus produced is known as Vitamin D₃. Once formed, it is absorbed into the blood stream where it is carried to the liver and there converted to 25-hydroxy Vitamin D. The kidneys then convert it into its biologically active form, 1,25-dihydroxy Vitamin D. Ironically, excess D₃ in the skin is degraded by Ultraviolet B light (290-320 nanometers)

EVOLUTION: Before animals could leave the relative weightlessness of a water environment, they needed a strong and rigid skeleton; they needed bone. In order to make bone, Vitamin D was necessary. It may have been first provided in the ancient sea by a phytoplankton, E. Huxley, which, when exposed to sunlight, manufactures Vitamin D.

It is possible that the massive elimination of the dinosaurs 65 million years ago, when an asteroid hit the earth and caused a massive dust cloud to form in the atmosphere, was not due to the cold thus produced. Rather, it may have been caused by decreased UVB that was filtered out by the asteroid dust. This created Vitamin D deficiency and the inability of the dinosaurs to make bone, resulting in their extinction.

HISTORY: Among other things, Vitamin D deficiency causes rickets, a debilitating disease characterized by decreased mineralization of bone resulting in weak bones and a characteristic bowing of the femur. When people moved from agricultural communities and farming activities where they naturally got a lot of sun exposure to working in factories in cities, the prevalence of rickets increased dramatically. The industrial revolution caused the majority of children born in northern European and American cities to suffer with rickets.

In the late 19th century it was shown that sunlight would cure rickets. By 1916 a mercury arc lamp had been produced which produced UVB and rickets was successfully treated with this artificial light source.

PHYSICAL PROPERTIES: Vitamin D is produced by UVB in the skin during peak sun hours (10 AM-3 PM). Before and after these times, the angle of the sun's rays through the atmosphere filters much of the UVB. Because of the angle of the sun, there is a huge decrease in UVB in the winter (November to March). It is estimated that during these months there is not enough UVB in sunlight north of 35 degrees north latitude (San Francisco) to produce adequate amounts of Vitamin D in the skin.

People of color require four-five times more UVB to produce adequate amounts of Vitamin D. It is estimated that 60% of urban blacks are Vitamin D deficient. The population at greatest risk is observant Muslim women.

A sunscreen with an SPF of 15 decreases UVB and Vitamin D production by 99%.

Elderly people produce less Vitamin D in their skin and are more prone to deficiency. As many as 70% of the elderly are deficient.

Vitamin D is fat soluble; it is taken up in fatty stores but is unusable in that location, creating deficiency states in obese individuals.

MOLECULAR BIOLOGY: Every type of cell in the human body has receptors for Vitamin D. It has the effect of decreasing the proliferation of cells and increasing their differentiation.

SOURCES: One MED (minimal erythema dose: amount light required to produce redness) of UVB to the arms and legs will produce 10-20,000 international units (IU) of Vitamin D. Exposure throughout peak hours of sun may produce as much as 50,000 IU per day.

Breast milk contains only 25 IU per liter. 76% of newborns exclusively nursed on breast milk are deficient. Adequate levels of Vitamin D are critical in the first year of life for normal bone development.

Milk is fortified with Vitamin D, containing 150 IU per 8-ounce glass. Bread is also fortified with Vitamin D.

Cod liver oil is a good source of Vitamins A and D. Standard capsules contain 560 IU of Vitamin D and 10,000 IU of Vitamin A.

Salmon contain Vitamin D but not enough to provide an adequate supplement. Wild salmon have much more Vitamin D than farmed, which have almost none.

There is no Vitamin D in the water north of 35 degrees north latitude.

RECOMMENDED DOSES: When doing lab test, order 25-OH Vitamin D.

- Normal range is 30-100 ng/dl.
- Optimum may be 50-70 ng/dl
- Do not see toxicity until 150 ng/dl is reached.
- Normal young person's dose 1000 IU daily.
- Pregnant women should take 1000 IU daily.
- Lactating women should take 4,000-6,000 IU daily.
- Obese people require 2-3 times normal.
- 100 IU increase daily will result in increase of 1 ng/dl
- In deficiency states, treat with 50,000 IU weekly for 8 weeks, then bi-weekly
- Don't worry about toxicity below 10,000 IU/day

DEFICIENCY STATES: Vitamin D deficiency has been shown to be more prevalent in

- Pre-eclampsia, and in women who require Caesarean section.
- Periodontal disease

- Heart disease
- Dementia
- Parkinson's Disease
- Amyotrophic Lateral Sclerosis (Lou Gehrig's Disease)
- Atopic dermatitis
- Osteomalacia: With decreased mineralization of bone associated with Vitamin D deficiency, patients develop bone and muscle pain often misdiagnosed as fibromyalgia, chronic fatigue, Lyme disease, and depression. The bone pain is resultant from the naked collagen matrix, which is exposed due to a lack of mineralization.
- Osteopenia and Osteoporosis
- Multiple Sclerosis
- Type I Diabetes Mellitus
- Rheumatoid Arthritis

NORMAL LEVELS ASSOCIATED WITH:

- Decreased prevalence of prostate, and colon cancer
- Decreased prevalence of breast cancer. Women who lived in a sunny climate between 10-19 years of age had decreased prevalence of breast cancer.
- Decreased prevalence of asthma
- Vigorous immune system: One mechanism is that Vitamin D, acting on macrophages produces toll-like receptors that produce hydroxycholes when stimulated. Vitamin D acting on the hydroxycholes produces canthelicidins, powerful elements of the immune system which are capable of killing bacteria, including the Tuberculosis bacteria. This is the rationale for Tuberculosis patients being treated in sanitariums in warm sunny climates in the 19th and early 20th century.
- Over 500 chemical substances in the intrinsic immune system are directly dependent on adequate Vitamin D levels.
- Muscle strength

VITAMIN D TRIVIA: When iguanas were first imported as pets, many died of collapsing bones. The problem: They were fed lettuce and crickets (no calcium) and got no UVB to make Vitamin D. The solution: Sunlamp in the terrarium and a calcium source.

MORE TO COME: As more comes to light about Vitamin D in the medical literature, I will report it here. I strongly recommend that all my patients get their Vitamin D level checked. Over half the patients I test are low.