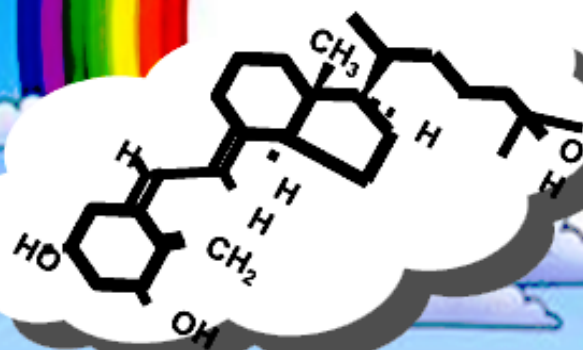


# Vitamin D: Everything You Need to Know

by

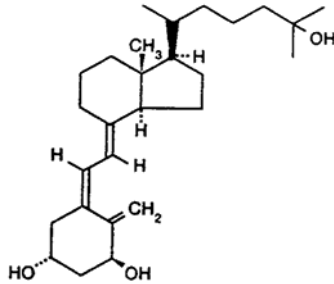
Sunil J. Wimalawansa, MD, PhD, MBA, DSc  
Professor of Medicine

The  
Sunshine  
Vitamin





# Skeletal and Non-Skeletal Effects of Vitamin D



**Sunil J. Wimalawansa, MD, PhD, MBA, DSc**  
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**Professor of Medicine**  
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# Vitamin D: Everything You Need to Know

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## **Preface**

The prevalence of vitamin D deficiency is rising worldwide and approaching epidemic proportions. Yet vast majorities of individuals have an undiagnosed and untreated vitamin D deficiency. This book provides information to enhance the awareness of vitamin D deficiency and facilitates the understanding of the physiology of vitamin D and the health consequences of vitamin D deficiency. In addition, the text provides information to assist in identifying the vulnerable population and illustrates safe and practical regimens for correcting the problem.

In addition to enhancing calcium absorption, vitamin D has many other important physiological effects, including neuro-modulation, muscle strength, and coordination, release of insulin, immune health, and prevention of cancer. Many individuals in industrialized countries, especially in the northern hemisphere, have low serum vitamin D levels. Whether this widespread vitamin D deficiency is related to the increasing incidences of cancer, type 2 diabetes, obesity, and heart disease remains to be determined.

Our evolution and existence are dependent upon exposure to sunlight. Ultraviolet rays provide more than 80% of our daily vitamin D requirement. Rickets in children and osteomalacia in adults are classic manifestations of severe vitamin D deficiency. This book explains both musculo-skeletal and other effects of vitamin D.

Inadequate serum 25(OH)D concentrations are associated with decreased performance and an increased propensity to falls and fractures secondary to muscle weakness and

poor neuromuscular coordination. Replenishment of serum 25(OH)D to above 30 ng/mL (75 nmol/L) would minimize these effects. Moreover, inadequate serum 25(OH)D levels are associated with decreased intestinal calcium absorption and consequent secondary hyperparathyroidism, mineralization defects, and accelerated bone loss. Poor vitamin D status and low calcium intake are important determinants of fracture risks.

This book describes the basic metabolism and mechanisms of action of vitamin D and its pleiotropic action in multiple tissues and organs. The second half of the book illustrates the consequences of vitamin D deficiency and the appropriate means of achieving vitamin D sufficiency with maintenance and therapeutic doses of supplementation.

Recent literature on vitamin D is full of controversies on its measurements, diagnosis, benefits, and the management of deficiency. The text explores the relationship of vitamin D with skeletal and non-skeletal systems, non-classic functions, and targets of vitamin D. Effective preventative strategies are needed to ensure adequate vitamin D in relation to geographical settings, seasons of the year, environmental pollution, skin pigmentation, and culture and habits.

*Sunil J. Wimalawansa*



# Chapter 1:

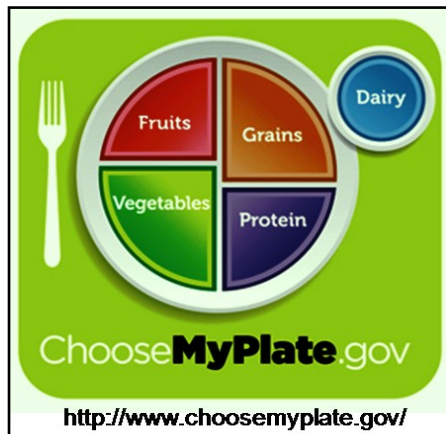
## Vitamin D Basics

### 1.1 Vitamins and micronutrients

Vitamins are classified into, water-soluble or fat-soluble. Water-soluble vitamins freely diffuse through tissues and go in and out of our bodies within days and weeks. They are absorbed in the intestine and excessive amounts excreted in the urine and feces. Although excessive intakes of vitamins can cause toxicity, overdosing is a rare event with water-soluble vitamins. However, due to the preferential storage within the body, excessive intake of fat-soluble vitamins has the potential to cause toxicity.

Because we are unable to make adequate vitamins in our body, we need to take them orally via diets or supplement. Humans get most of their vitamins and micronutrients from the diet. For tips on building good nutritional habits, please visit <http://www.mypyramid.gov>.

This food guide pyramid



outlines what one should eat every day. It can be adapted to create healthy meals and diets for most of us.

**Using the food pyramid:** The following example illustrates the number of servings of particular foods that should be eaten daily.

- ✓ 5 to 8 servings of grain products: bread (preferably whole wheat), brown rice or pasta, and high-fiber cereals
- ✓ 5 servings of vegetables and 3 servings of fruits
- ✓ 3 servings of milk products: milk, cheese, and yogurt



- ✓ 2 to 3 servings from alternative proteins: meat, poultry, fish, legumes (beans, tofu), peanut butter, eggs, and nuts

The top of the pyramid indicates the foods that should be eaten sparingly, fats, and sweets. These foods should not replace healthy foods. Watch the quantities and the calorie intake.

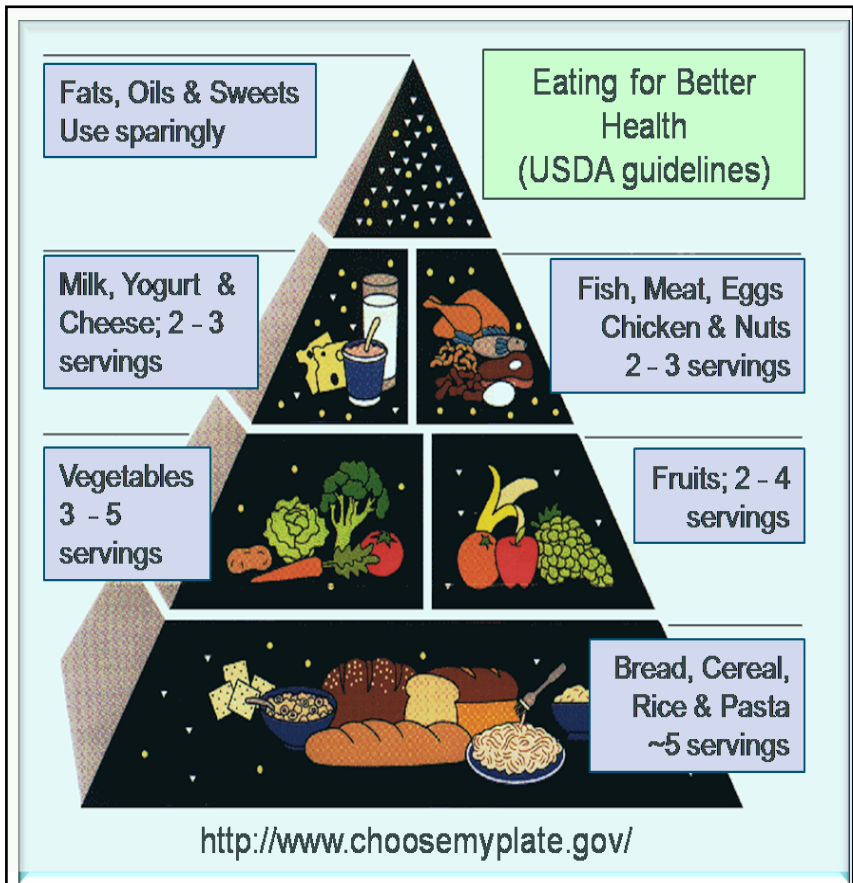


Figure 1: A simplified version of the classical food pyramid that is illustrated in the <http://www.mypyramid.gov>.

### **Vitamins and human health:**

In the early 20th century, the work of McCollum et al established the existence of both water- and fat-soluble substances that .....



## About the Author

Sunil Wimalawansa is a University Professor, Professor of Medicine, Endocrinology, Metabolism, and Nutrition, and former Chief of Endocrinology at the University of Medicine and Dentistry, Robert Wood Johnson Medical School, New Jersey, USA.<sup>1</sup> He is also a Professor of Physiology and Integrative Biology at the University of Medicine and Dentistry, Graduate School Biomedical Sciences. He holds an Executive Master's of Business Administration Degree from the Rutgers University School of Business and a Diploma in Medical Administration from Johns Hopkins School of Business.

He had his education at Ananda College, Colombo and postgraduate studies at the University of Peradeniya in Sri Lanka, Royal Postgraduate Medical School in United Kingdom, Rutgers and Johns Hopkins Universities in the United States. He is a member or a board director of several committees of national and international scientific societies. He is the founder-president of few charitable organizations, including the International Foundation for Revitalization, Empowerment, Education, and Development; Hela Empowerment Foundation–International; International Foundation for Chronic Disabilities; and the chairperson of the Education Trust Fund for Needy Children, and the Wimalawansa Charitable Foundation.

His original contributions to science and medicine include current worldwide practiced standard of care in some medical methods. He holds 6 medical patents, and has given more than 170 invited presentations at national and international scientific and medical meetings. He has published over 130 peer-reviewed scientific articles, 4 books, and 45 scientific book chapters; and has made 260 scientific presentations worldwide.

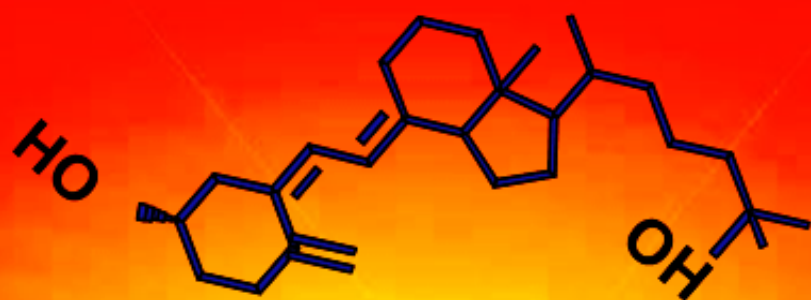
Dr. Wimalawasna is the recipient of many awards including Dr. Oscar Gluck International Humanitarian award in 2007 and the prestigious Lifetime Achievement Award in 2005 from the Sri Lankan Foundation for his worldwide contributions to science, philanthropic work, and humanity. Other awards he received include an International Award for Clinical Excellence in Metabolic Bone Diseases in 1991, multiple young-investigator scientific awards and American Endocrine Society Glen Foundation Awards. He is also the recipient of The Doctor of Science (D.Sc.) degree in 2001.

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**Vitamin D**

**USD: \$20**