

The Department of Mechanical Engineering presents:

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11:10AM-12:00PM

Bourns Hall A265

FROM VITAMIN D TO HORMONE D: FUNDAMENTAL OF THE VITAMIN D ENDOCRINE SYSTEM IN RELATION TO GOOD HEALTH

Abstract:

Vitamin D is essential for life in higher animals. Classically it has been shown to be one of the most important biological regulators of calcium metabolism and homeostasis via stimulating the intestinal absorption of calcium, facilitating the deposit of calcium in bone, and regulating the excretion of calcium by the kidney.

The molecular structure of vitamin D is closely allied to that of classical steroids (cholesterol) and steroid hormones (e.g., estrogens, glucocorticoids, etc). Current evidence supports the concept that the classical biological actions of the nutritionally important fat soluble vitamin D in mediating calcium homeostasis are not mediated by the parent vitamin D, but by a vitamin D endocrine system which coordinates the metabolism of vitamin D into the steroid hormone 1,25(OH)₂-vitamin D (referred to here as hormone D). Hormone D, like other steroid hormones, can only generate biological responses via interacting with its partner receptor, the vitamin D receptor (VDR) to form a hormone-receptor complex, that interacts selectively with genes to regulate the production of new proteins that are involved in the appearance of the biological response (e.g. stimulation of intestinal calcium absorption).

It is now clear that our body's target organs which possess the VDR include many more tissues than the classical intestine, bone, and kidney. The VDR is also present in the pancreas, pituitary, skin, breast tissue, placenta, hematopoietic cells, immune cells and cancer cells of various origins. Key advances in understanding the mode of action of the hormone D have been made by a thorough study of the VDR as a classical nuclear receptor as well as the emerging studies describing the presence of the VDR in the plasma membrane.

There are clinical applications for hormone D or related drug forms of hormone D for treatment of the bone diseases of renal osteodystrophy, osteomalacia and osteoporosis, as well as psoriasis, and hypoparathyroidism; other clinical targets for hormone D currently under investigation include its use in leukemia, breast, prostate and colon cancer as well as an immunosuppressive agent.

Scientists and nutrition experts agree that about half of the elderly in North America and two-thirds of the rest of the world are not getting enough vitamin D to maintain a healthy bone density, that will lower their risks for fractures. Probably the nutritional Recommended Dietary Allowance (RDA) for vitamin D should be adjusted upwards from the presently approved RDA of 400 IU to levels as high as 2000 IU.

Bio:

ANTHONY W. NORMAN, Distinguished Professor of Biochemistry and Biomedical Sciences, University of California, Riverside; B.A., 1959 Oberlin College; M.S., 1961, Ph.D., 1963 University of Wisconsin, Madison. *Research Interests:* Mechanism of action of the steroid hormone 1,25(OH)₂-vitamin D₃; vitamin D structure-function relationships, actions of the vitamin D receptor (VDR).

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