MedicalXpress

Vitamin D a key player in overall health of several body organs, says UC Riverside biochemist

October 9 2008

Essential for life in higher animals, vitamin D, once linked to only bone diseases such as rickets and osteoporosis, is now recognized as a major player in contributing to overall human health, emphasizes UC Riverside's Anthony Norman, an international expert on vitamin D.

In a paper published in the August issue of the *American Journal of Clinical Nutrition*, Norman identifies vitamin D's potential for contributions to good health in the adaptive and innate immune systems, the secretion and regulation of insulin by the pancreas, the heart and blood pressure regulation, muscle strength and brain activity. In addition, access to adequate amounts of vitamin D is believed to be beneficial towards reducing the risk of cancer.

Norman also lists 36 organ tissues in the body whose cells respond biologically to vitamin D. The list includes bone marrow, breast, colon, intestine, kidney, lung, prostate, retina, skin, stomach and the uterus.

According to Norman, deficiency of vitamin D can impact all 36 organs. Already, vitamin D deficiency is associated with muscle strength decrease, high risk for falls, and increased risk for colorectal, prostate and breast and other major cancers.

"It is becoming increasingly clear to researchers in the field that vitamin D is strongly linked to several diseases," said Norman, a distinguished

professor emeritus of biochemistry and of biomedical sciences who has worked on vitamin D for more than 45 years. "Its biological sphere of influence is much broader than we originally thought. The nutritional guidelines for vitamin D intake must be carefully reevaluated to determine the adequate intake, balancing sunlight exposure with dietary intake, to achieve good health by involving all 36 target organs."

Vitamin D is synthesized in the body in a series of steps. First, sunlight's ultraviolet rays act on a precursor compound in skin. When skin is exposed to sunlight, a sterol present in dermal tissue is converted to vitamin D, which, in turn, is metabolized in the liver and kidneys to form a hormone. It was Norman's laboratory that discovered, in 1967, that vitamin D is converted into a steroid hormone by the body.

The recommended daily intake of vitamin D is 200 international units (IU) for people up to 50 years old. The recommended daily intake of vitamin D is 400 IU for people 51 to 70 years old and 600 IU for people over 70 years old. Norman's recommendation for all adults is to have an average daily intake of at least 2000 IU.

"To optimize good health you must have enough vitamin D," he said. "Vitamin D deficiency is also especially of concern in third world countries that have poor nutritional practices and religious customs that require the body to be covered from head to toe. Ideally, to achieve the widest frequency of good health by population, we need to have 90 percent of the people with adequate amounts of vitamin D."

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 healthy bone density, lower their risks for fracture and improve tooth attachment.

"There needs to be a sea change by various governmental agencies in terms of the advice they present to citizens about how much vitamin D

should be taken," Norman said. "The tendencies of people to live in cities where tall buildings block adequate sunlight from reaching the ground, to spend most of their time indoors, to use synthetic sunscreens that block ultraviolet rays, and to live in geographical regions of the world that do not receive adequate sunlight all contribute to the inability of the skin to biosynthesize sufficient amounts of vitamin D."

Found in minute amounts in food, vitamins are organic substances that higher forms of animals need to grow and sustain normal health. Vitamins, however, are not synthesized in sufficient amounts to meet bodily needs. Therefore, the body must acquire them through diet or in the form of supplements.

Because it is found in very few foods naturally, milk and other foods (often orange juice) are fortified with vitamin D.

While deficiency of vitamin D impacts health negatively, ingestion of extremely high doses of vitamin D can cause hypercalcemia, a condition in which the blood's calcium level is above normal. The highest daily 'safe' dose of vitamin D is 10,000 IU.

"More than ever we need to increase the amount of research on vitamin D, with more funding from government agencies and pharmaceutical companies, to meet the challenge of preserving or improving the health of everyone on the planet," Norman said.

Source: University of California - Riverside

Citation: Vitamin D a key player in overall health of several body organs, says UC Riverside biochemist (2008, October 9) retrieved 6 May 2024 from https://medicalxpress.com/news/2008-10-vitamin-d-key-player-health.html

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