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Low vitamin D levels may speed up bone aging

By Stephen DANIELLS , 11-Jul-2013

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Vitamin D deficiency may not only reduce bone density, but also detrimentally affect bone quality, and speed up the aging of human bone, says a new study.

Using state-of-the-art technology, researchers from the University Medical Center Hamburg in Germany, and the University of California, Berkeley found that vitamin D deficiency was associated with less mineralization on the surface of the bone, as well as structural characteristics of older and more brittle bone.

"Vitamin D deficiency [...] creates a paradox," wrote the researchers, led by Björn Busse. "The mineralized tissue ages despite an endocrine state that promotes high turnover and resorption of old bone. Because of the coating of the bone with resorption-resistant osteoid [the un-mineralized, organic portion of the bone matrix], vitamin D deficiency causes aging of the tissue and compromises its structural integrity and resistance to fracture."

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"Well-balanced vitamin D levels are essential to maintain bone's structural integrity."

have the lowest intakes'

The study is published in [Science Translational Medicine](#) .

Vitamin D supplementation

In an accompanying *Focus* article in the same journal, Lorenz Hofbauer and Christine Hamann from the Dresden Technical University Medical Center in Germany stated that the new study provides a rationale to continue vitamin D supplementation in people with osteoporosis.

"Nearly 90% of elderly persons or patients who are institutionalized or in the hospital for a prolonged time have vitamin D deficiency, many with levels below 10 ng/ml," they wrote.

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"Moreover, with aging the efficacy of the skin and kidney to synthesize or activate vitamin D is declining. Thus, vitamin D supplementation has been a well-established baseline therapy for patients with osteoporosis. In practical terms, vitamin D deficiency needs to be corrected before embarking on specific osteoporosis therapy [...] Apart from preventing osteoporosis and bone fractures, vitamin D promotes muscle strength and thus reduces the propensity to fall down."

Study details

Busse and his co-workers analyzed bone samples from 30 participants (half of whom were deficient in vitamin D), and used state-of-the-art technology, including synchrotron radiation-based micro computed tomography, to characterize bone quality on the smallest of size scales, from nanometers to micrometers.

While vitamin D deficiency was associated with less mineralization on the surface of the bone, the researchers found that, underneath, bone was actually more heavily mineralized. The data also indicated structural characteristics of older and more brittle bone.

Islands of mineralized bone were found to be surrounded by a collagenous boundary, which prevented them from being properly remodeled. Cut off from a supply of cells which remodel bone (osteoclasts), these islands of mineralized bone begin to age, while overall bone mineralization decreased from a lack of calcium, said the researchers.

"We suggest that local tissue aging is a key cause of increased fracture risk in vitamin D-deficient osteomalacia [softening of bones caused by flawed bone mineralization], contrary to previous beliefs that the increased osteoid volume was the main contributor associated with weakening of the bones," they wrote.

Bone & Joint Health 2013

NutraIngredients will host an online event, **Bone & Joint Health** , on July 24th. For more information and to register, [please click here](#) .

Source: [Science Translational Medicine](#)

10 July 2013, Volume 5, Issue 193, 193ra88, doi:



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Vitamin D deficiency (less than 20 ng/mL) can cause a number of health issues, including rickets and other musculoskeletal diseases. Recently, data has also suggested that vitamin D deficiency and vitamin D insufficiency (between 21-29 ng/mL) may be linked to cancer, autoimmune diseases, infectious diseases, type 2 diabetes and cardiovascular disease.

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"Vitamin D Deficiency Induces Early Signs of Aging in Human Bone, Increasing the Risk of Fracture"

Authors: B. Busse, H.A. Bale, E.A. Zimmermann, et al.

Focus: [Science Translational Medicine](#)

Volume 5, 193fs27, doi: 10.1126/scitranslmed.3006566

"Deconstructing Vitamin D Deficiency"

Authors: L.C. Hofbauer, C. Hamann

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