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Medication to prevent osteoporotic fractures may hinder the repair of damaged tissue

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A study at Sahlgrenska Academy, Sweden, has found that one of the most common medications to prevent osteoporitic fractures gives rise to previously unknown mineralization of bone cells. The discovery may be important for understanding the effect of medication on bone quality.

"This type of mineralization is not desirable in the long run," Furqan A. Shah, Ph.D. in Biomaterials Science, says. He is the principal author of an article that has been published in *Nano Letters*.

Along with Anders Palmquist, Associate Professor of Biomaterials Science, and colleagues at Uppsala University and McMaster University in Canada, Dr. Shah has taken a new approach to studying bone biopsies from eight patients. All of them had been treated with bisphosphonates, which are often prescribed to prevent osteoportic fractures.

Advanced nanoanalytical electron microscopy enabled the researchers to perform detailed, high-resolution analyses of the crystals formed in the bone cavities that remain after normal cell death. No similar mineralization was detected in the bone tissue of healthy controls. Ordinary bone mineral filled their cavities instead.

"The crystals are not normal," Dr. Shah says. "Even though there are hundreds of them in every cell, they are very large under these circumstances. In other words, they might have grown extraordinarily slowly in the cavities."

When relatively large, more chemically stable and harder crystals form, continual development and rejuvenation of bone tissue are impaired and quality deteriorates.

The study also demonstrates the importance of correlative analytical techniques that permit imaging in conjunction with detailed analysis of the crystal phase and chemical composition," Associate Professor Palmquist says.

The authors emphasize that their research does not call prescription of bisphosphonates, which have been commonly used for many years, into question. Nevertheless, the discovery may be a key consideration when new medications are developed.

"We have found a piece of the puzzle that may help us better understand the mechanisms that influence bone quality and adverse effects of medication," Associate Professor Palmquist says.

More information: Furqan A. Shah et al. Micrometer-Sized Magnesium Whitlockite Crystals in Micropetrosis of Bisphosphonate-Exposed Human Alveolar Bone, *Nano Letters* (2017). DOI: 10.1021/acs.nanolett.7b02888

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