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High-Res Images Expose Bone's 'Glue'

Extreme close-up images of human bone have revealed one of the secrets of its strength, researchers report. A better understanding of its material properties could lead to improved therapies for bone fractures, or help avoid them altogether.

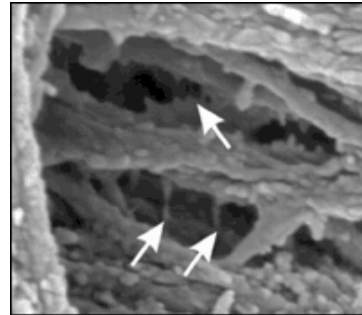


Image: HANSMA LAB/UCSB

Previous studies had demonstrated that the mechanical properties of bone arise from its protein fibers, known as collagen fibrils, which were thought to be coated in a very thin film of mineral crystals. Using atomic force microscopy, Georg E. Fantner of the University of California at Santa Barbara and his colleagues took the highest-resolution images yet of human bone, which showed glue-like filaments holding the fibrils together. When a bone is stressed, sacrificial bonds within the glue can uncoil or break without the entire bone fracturing. These so-called molecular shock absorbers have been seen before: in abalone shells. "It's truly remarkable to find the same fundamental mechanisms operating in bone," says study co-author Daniel E. Morse of the University of California at Santa Barbara.

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As people age, bone loss becomes both more likely and more dangerous: a serious bone fracture late in life can be particularly detrimental to a person's well-being. "We're especially interested in learning how these molecules change and become depleted with age as well as in certain diseases," Morse explains. "A potential benefit from these discoveries is the prospect that we might now learn how to protect bone from these deleterious changes, and perhaps actually reverse some of the changes." The findings will be published in the August issue of the journal *Nature Materials*. --Sarah Graham

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