

Daily vibration may help protect aging bones

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Courtesy of Medical College of Georgia
and World Science staff

Daily, whole-body vibration may reduce the bone density loss that usually occurs with age, researchers report based on a mouse study.

The scientists found that 12 weeks of daily, 30-minute sessions in 18-month old male mice seemed to forestall the annual loss that can lead to fractures, disability and death. The rodents were equivalent in age to 55- to 65-year-old humans, added the investigators, biomedical engineer Karl H. Wenger of the Medical College of Georgia and colleagues.

Reporting the findings in the research journal *Bone*, they added that vibration improved density around the hip joint with a shift toward higher density in the femur, the long bone of the leg. The investigators also found a reduction in body levels of a substance associated with bone breakdown and an increase in the surface area involved in bone formation in the vibrated mice.

The findings provide new evidence that the technique, which dates back to the 1800s and is now showing up in homes, gyms and rehabilitation clinics, has bone benefit, particularly as a low-risk option for injured people with limited mobility, Wenger said.

The scientists theorize that the rhythmic movement, which produces a sensation similar to that of a vibrating cell phone but on a larger scale, exercises cells so they work better. Vibration prompts movement of the cell nucleus, which is suspended by numerous threadlike fibers called filaments. "The filaments get all deformed like springs and then they spring back," Wenger said.

All the movement releases substances called transcription factors that spur the formation of new osteoblasts, the cells that make bone, Wenger and colleagues explained. With age, the balance of bone production and destruction – by osteoclasts – tips to the loss side.

In the case of an injury, vibration acts on stem cells, the master controllers of the healing process, he added. "We think that in fracture healing, you get a more dramatic response. We don't know exactly why it affects the biology differently but it's likely because of the extent to which stem cells invade the injured area," Wenger said. His team also found that vibration slows stem cell proliferation, which may not make sense at first glance, they noted, but likely means more stem cells differentiate into bone cells rather than continuing to just make more stem cells.

To see if their findings translate to the trauma clinic, the researchers are evaluating vibration tolerance in patients with lower-limb fractures. The investigators said they're finding, surprisingly, that even two weeks after injury the subtle vibration is soothing, rather than painful, to most.

The scientific team added that in previous research by Clinton T. Rubin at the State University of New York at Stony Brook, post-menopausal women at the peak age of bone decline experienced results similar to those of the aging mice. Wenger's studies used only male mice so that effects such as fluctuating hormones wouldn't affect the results.

While vibration lacks the same cardiovascular benefit of exercise, animal and human studies also have shown it can improve muscle strength and weight loss, according to Wenger and colleagues.