

A fracture anywhere reduces bone density everywhere

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Blaine Christiansen and his lab team are on the path to finding therapies that reduce bone losses following fractures. Pictured (top to bottom on the left) are Christiansen, Armaun Emami, Hailey Cunningham and (right) Allison Hsia. Credit: Copyright UC Regents courtesy of UC Davis Health

Breaking a bone causes bone density losses throughout the body, not just close to the site of the fracture, and primarily around the time of the fracture, two new studies from UC Davis Health show.

The studies are among the first to associate fractures with systemic [bone loss](#). They also begin the path to finding treatments that preserve long-term skeletal health and reduce susceptibility to additional fractures and, potentially, osteoporosis, which is diagnosed when bone-density losses are severe.

Both investigations were led by Blaine Christiansen, whose research focuses on identifying changes in musculoskeletal tissue due to injury, aging or disease.

"We know one fracture seems to lead to others,

but we haven't known why," said Christiansen, associate professor of orthopaedic surgery at UC Davis. "Our work is the first step on the path to identifying the cellular mechanisms of systemic bone loss."

The first study, published in *Osteoporosis International*, was based on about 4,000 participants in the [Study of Osteoporotic Fractures](#), an observational study of older women that included hip bone mineral density (BMD) measures and fracture history gathered regularly over 20 years.

Outcomes showed that hip BMD decreased over time for all women in the study, but was greatest for those who had fractured a bone ? even if the fracture was not near the hip. BMD reductions averaged between .89 and .77 percent per year for those with fractures, and .66 percent per year for those with no fractures. Those losses were greatest within the first two years of a break.

Published in the *Journal of Bone and Mineral Research*, the second study was conducted using mice with femur [fractures](#) and BMD tests in various bones. Once again, bone loss occurred throughout the body, most notably in the spine, and was greatest within the first two weeks of fracture. It also was accompanied by higher levels of inflammatory markers in the blood.

Outcomes of the second study showed interesting age-related recovery differences as well. Younger mice eventually recovered their pre-fracture BMD levels, while older mice did not.

Christiansen next hopes to further characterize the post-fracture inflammatory factors that may contribute to bone loss following fracture.

"It's possible that these factors are key to initiating BMD loss once a bone is broken," Christiansen said. "Ultimately, we hope to develop therapeutic

strategies that interrupt those processes and prevent [bone](#) loss."

More information: Incident fracture is associated with a period of accelerated loss of hip BMD: the Study of Osteoporotic Fractures, *Osteoporosis International* (2018). DOI: [10.1007/s00198-018-4606-6](https://doi.org/10.1007/s00198-018-4606-6)

Provided by UC Davis

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