

Researchers uncover benefits of aspirin for treating osteoporosis

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Researchers at the University of Southern California, School of Dentistry have uncovered the health benefits of aspirin in the fight against osteoporosis. Forty-four million Americans, 68 percent of whom are women, suffer from the debilitating effects of osteoporosis according to the National Institute of Health. One out of every two women and one in four men over 50 will have an osteoporosis-related fracture in their lifetime.

This latest study identifies aspirin's medicinal role on two fronts. In mice, the drug appears to prevent both improper bone resorption and the death of bone-forming stem cells. The findings will be published in *PLoS ONE* <http://www.plosone.org/doi/pone.0002615> on Wednesday, July 9.

An aspirin regimen appears to help mice recover from osteoporosis in two useful ways, striking a balance between bone formation and resorption, according to Associate Professor Songtao Shi and Research Associate Takayoshi Yamaza of the USC School of Dentistry's Center for Craniofacial Molecular Biology (CCMB).

The silent disease affects both men and women. In women, bone loss is greatest during the first few years after menopause. Osteoporosis occurs when bone resorption (loss of bone) occurs too quickly or when formation (replacement) occurs too slowly.

According to Shi, the removal of the ovaries and the resulting decrease in estrogen induces osteoporosis in mice, much like the onset of the

disease in post-menopausal women. It is commonly thought that T-lymphocytes, a type of immune system cell, play a pivotal part in this process by over-activating osteoclasts, the bone cells that reabsorb bone material from the skeleton. Most current osteoporosis therapies aim to curb overactive osteoclasts.

However, there seems to be another side to the T-lymphocytes', or T-cells', role in osteoporosis, Yamaza says. While the immune cells typically attack disease cells and other foreign entities, the T-cells can mistakenly attack healthy stem cells.

"After infusing the mice with T-cells, the T-cells impaired the function of bone marrow mesenchymal stem cells as well as caused osteoclast numbers to increase," he says.

The bone marrow mesenchymal stem cells, or BMMSC, differentiate to become many different cells including osteoblasts, the cells responsible for bone formation. If this process is impaired by T-cells, bone formation cannot keep up with bone resorption caused by osteoclasts, and bone mineral density decreases – the hallmark of osteoporosis that leads to skeletal structural deterioration and fractures.

An aspirin regimen has been linked in earlier epidemiological studies to better bone mineral density, but the mechanisms of its interactions in regards to bone health had not yet been studied extensively, Shi said.

"We've shown how aspirin both inhibits bone resorption and promotes osteoblast formation," Shi says.

Another exciting aspect of the aspirin treatment is that the dose administered to the mice in order to increase their bone mineral density is the same as that of a typical human aspirin regimen when adjusted for body weight differences, he adds. While the species difference is still a

factor, the results are promising.

"When we gave a large amount of aspirin to the mouse by injection, it did not work," Shi says, "but when we gave a low dose in the mice's water for a long period of time, similar to a human dosage, the bone mineral density increased."

Shi and Yamaza hope that their work will translate into new clinical strategies for osteoporosis.

"We have opened a door," Shi says. "We hope other scientists can confirm what we've found and move the treatment forward."

The use of aspirin offers hope to patients and doctors searching for a potential alternative to bisphosphonates currently being used as a means of prevention and treatment for osteoporosis. This latest study opens up the possibility that aspirin some day will not only be prescribed to ward off heart disease but also osteoporosis.

Source: University of Southern California

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