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New treatment boosts bone healing and regrowth

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A drug originally used to treat iron poisoning can significantly boost the body's own ability to heal and re-grow injured bones, according to researchers at the University of Alabama at Birmingham (UAB).

The researchers injected the drug deferoxamine (DF), which is designed to reduce iron overload, into injured mouse bones. They found DF triggered the growth of new blood vessels, which in turn kicked off bone re-growth and healing.

In the study, bone density surrounding the injury more than doubled to 2.6 cubic millimeters in treated bones compared to 1.2 cubic millimeters in untreated bones, the researchers said. The new blood vessel growth and bone healing was achieved through a cell pathway that helps the body respond to low oxygen levels, a common problem when blood supply is affected by bone fracture and disease.

Findings on this cell pathway have broad implications for improving treatment of bone fractures, bone disease and other musculoskeletal disorders, said Shawn Gilbert, M.D., an assistant professor of orthopedic surgery in the UAB School of

Medicine, and Chao Wan, M.D. Ph.D., an instructor in the UAB Department of Pathology, both co-authors on the study.

"With DF activating this pathway, we've proven a significant point – it is possible to explore new, safe and more affordable ways kick-start bone

repair," Gilbert said.

"Current treatments use complex proteins, which are expensive to make and cost thousands of dollars per dose. The type of agent used in this study is a simple, small molecule drug that costs hundreds, not thousands," Gilbert said.

The UAB findings are published in the online version of the journal *Proceedings of the National Academy of Sciences* and will soon appear in a print edition.

"The results from this study are a milestone for future studies looking at other compounds and agents to improve new-blood-vessel growth in skeletal and other tissues that need adequate blood supply to regenerate," Wan said.

The UAB tests were performed in conjunction with a bone lengthening procedure commonly used in children and adults, and has proven to aid bone healing. The study mice were anesthetized for surgery, and one leg bone was cut clean through and a pulling device attached temporarily to stretch the bone gap for the next 10 days.

During the stretching, the bone gap was injected with five DF doses. Two weeks after the last DF dose, X-rays of the mice legs were taken to measure bone regeneration.

DF is a drug that binds to excess iron in the body and helps with excretion through the bowels and bladder, a process sometimes called iron chelation. DF is used to treat a variety of medical conditions, including iron overload, transfusion-related blood poisoning and in combination with dialysis.

In the findings on post-treatment increased bone density, the UAB

researchers found significant increases in the number of new blood vessels, and excellent connectivity between those vessels. The new blood vessels are required regenerate bone of equal or better strength than the original bones.

Gilbert said it follows that this cell pathway is a prime target for future human studies using DF and other drugs to strengthen the body's bone-healing potential, especially since poor blood supply is common in fractures and bone disease.

Source: University of Alabama at Birmingham