# Differences in bone healing in mice may hold answers to bone healing for seniors

March 21 2013

(Medical Xpress)—By studying the underlying differences in gene expression during healing after a bone break in young versus aged mice, Jaimo Ahn, MD, PhD, assistant professor of Orthopaedic Surgery at the Perelman School of Medicine, University of Pennsylvania, and his colleagues aim to find specific pathways of fracture healing in humans. The team of researchers will present their findings in a poster presentation beginning Tuesday, March 19, 2013 at the 2013 American Academy of Orthopedic Surgeons annual meeting in Chicago.

Problems with healing after bone fractures in elderly patients can be attributed, in part, to the compromised function of certain stem cells, called MSCs, that participate in the mending of the fracture. MSCs (Mesenchymal stem cells), can differentiate into a variety of cell types: cartilage, fat and – most notably in fractures – bone cells.

An important pathway—called Notch, for the name of the receptor that is critical in relaying the "signal"—has been identified as a critical event in the healing of non-skeletal tissues in an age-dependent manner. In the new study, the Penn team suspected that Notch would play a vital role in healing aged broken bones.

The team characterized fracture healing as a function of age and time post fracture in laboratory mice. Five-month-old laboratory mice are reproductively and skeletally mature. At 25-months-old, mice of the same strain are considered "geriatric." The researchers looked for progression of tissue and healing and the expression of Notch pathway

genes including the ligands (small molecules that bind Notch to spur it into action), as well as Notch receptors and their down-stream effects. They examined both the healing fracture itself as well as the MSCs from the two age groups.

The team found that young mice produce a more robust healing response (timing, quantity and quality) than geriatric mice which persisted throughout healing. Interestingly, base line levels of Notch signaling are reduced in MSCs from geriatric mice. However, MSCs from young and old mice are both able to be stimulated by Jagged1 (one of the main ligands of Notch).

Provided by University of Pennsylvania