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Proteins to yield new clues in fight against osteoporosis

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A $1.76 million study at Rensselaer Polytechnic Institute seeks to identify new methods of diagnosing osteoporosis and inform the development of next-generation drugs to treat the bone disease.

The five-year study, funded by the U.S. National Institutes of Health (NIH), is led by Deepak Vashishth, professor and head of the Department of Biomedical Engineering at Rensselaer. Partnering with researchers from Yale University and the Hospital of Special Surgery, Vashishth's will investigate what role two proteins, osteocalcin and osteopontin, play in bone fractures over time.

"Age-related bone fractures are a major health problem in the United States, and the risk of suffering this kind of fracture increases as we get older and our bones grow more fragile," Vashishth said. "Our study examines how the proteins osteocalcin and osteopontin may impact bone fragility and fracture. We're confident that our results will lead to new methods of diagnosing osteoporosis, provide new targets for drug development, and advance the fight against this devastating disease."

The new study builds from Vashishth's past research into the effects of modifying the molecular composition of certain proteins in bone, better understanding the relationship of bone biology and bone fracture, and developing new treatments to combat and reverse bone fragility. While bone mass historically was considered to be a significant predictor of bone fracture risk, current studies show bone loss to be a key contributor, but not the sole cause, of bone fracture. This means other

factors, such as the molecular biology of an individual's bones, need to be examined in order to more fully understand age-related bone fragility.

Bones are comprised primarily of bone matrix, made up of woven or stacked cells. The proteins located between these cells, called extracellular matrix proteins, may offer some clues to unlocking the secret of bone fragility. Evidence suggests two such proteins, osteocalcin and osteopontin, can influence the formation of nanoscale damage and microcracks in bone. However, very little is known about how or why this works.

"We will investigate the effects of osteocalcin and osteopontin on damage morphology and bone fragility at the nanoscale, microscale, and macrostructural scale," Vashishth said. "We believe our results will show, conclusively, how the combination of nanoscale damage, paired with creation of nanoscale bands affected by the proteins, actually impact the overall structure and fragility of the bone. Once this is established, we and other researchers will be able to start working on new treatments for osteoporosis and related bone diseases."

Provided by Rensselaer Polytechnic Institute