

New research on structure of bones raises questions for treatment of osteoporosis

October 16 2007

Researchers have discovered that the structure of human bones is vastly different than previously believed – findings which will have implications for how some debilitating bone disorders are treated.

Researchers from the University of Cambridge, the Animal Health Trust in Newmarket, and the BAM Federal Institute of Materials Research and Testing, Berlin, have discovered that the characteristic toughness and stiffness of bone is predominantly due to the presence of specialized sugars, not proteins, as had been previous believed. Their findings could have sweeping impacts on treatments for osteoporosis and other bone disorders.

Scientists have long held the view that collagen and other proteins were the key molecules responsible for stabilizing normal bone structure. That belief has been the basis for some existing medications for bone disorders and bone replacement materials. At the same time, researchers paid little attention to the roles of sugars (carbohydrates) in the complex process of bone growth.

For this research, funded by the Biotechnology and Biological Sciences Research Council (BBSRC), the UK and Berlin teams studied mineralization in horse bones using an analysis tool called nuclear magnetic resonance (NMR). They found that sugars, particularly proteoglycans (PGs) and glycosaminoglycans (GAGs), appear to play a role which is as important as proteins in controlling bone mineralization - the process by which newly-formed bone is hardened with minerals such

as calcium phosphate.

Osteoporosis is a chronic and widespread disease in which mineral formation is disturbed, leading to brittle bones, pain, and increased fractures. Osteoarthritis, a hallmark of which is joint cartilage and GAG depletion, is also accompanied by abnormal bone mineralization. Both of these diseases can be debilitating, often crippling, to older people – a problem which will only intensify as our population ages. Among the young, especially sportsmen and women, bone and joint injuries prove the most intractable and are also the ones most likely to develop into afflictions (such as osteoarthritis) later in life.

Dr David Reid, from the Duer Group, Department of Chemistry, at the University of Cambridge, who played a significant part in the research, said, “We believe our findings will alter some fundamental preconceptions of bone biology. On a practical level they unveil novel targets for drug discovery for bone and joint diseases, new biomarkers for diagnosis, and new strategies for developing synthetic materials that could be used in orthopaedics.

“They may also strengthen the rationale for the current popularity of over-the-counter joint and bone pain remedies such as glucosamine and chondroitin, which are based on GAG sugar molecules.”

Source: University of Cambridge

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