Experimental bone can help osteoarthritis patients

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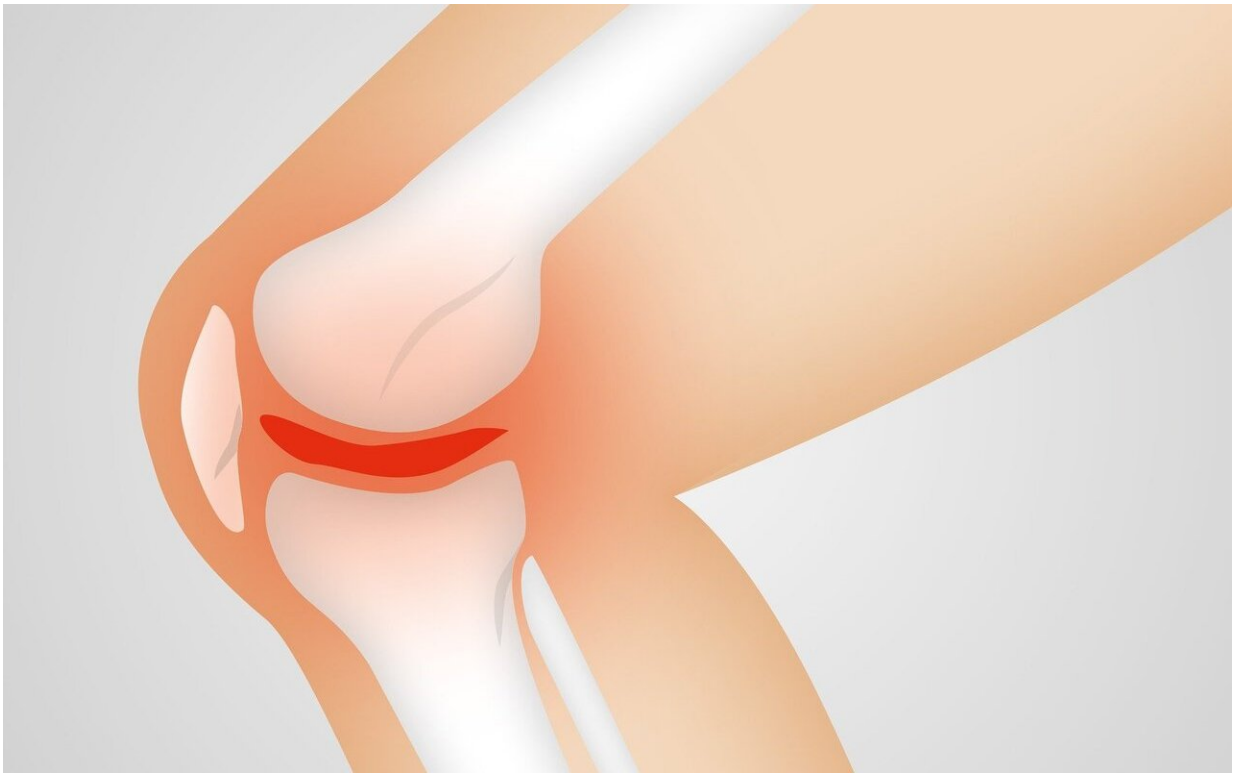

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Researchers from the Faculty of Chemical Technology, Kaunas University of Technology (KTU), Lithuania are developing an artificial bone that can be used to treat osteoarthritis. The bi-functional composite imitates the complex osteochondral structure of a joint, i.e. both

cartilage and bone tissues.

According to the World Health Organisation, around 10 percent of men and 18 percent of women over 60 suffer from osteoarthritis. The onset of the condition is associated with thinning of the cartilage due to age; on average, people over 55 feel pain in four joints. Osteoarthritis, the most common inflammatory bone and cartilage disease, generally affects the knees, hip, spine and tarsus.

While common treatment for osteoarthritis is pain or anti-inflammatory medication, KTU chemists are offering a novel approach using a bi-functional scaffold as an implant compensating cartilage and bone defects.

"A lot of people suffer from painful joints, and the majority of them have osteoarthritis. To create new composites for solving this problem is especially challenging—cartilage tissue is renewing itself at a very slow rate, and it forms a complex structure together with a bone," says Simona Miseviciute, an applied chemistry undergraduate, who was conducting the experiment under the supervision of Dr. Alisa Palaveniene.

The bi-functional scaffold, created at KTU aims to compensate defects of both cartilage and bone. Made of several different substances—hydroxyapatite, gelatine and chitosan—the scaffold imitates the complex osteochondral structure and functionality of the joint and fills the fractures of the two tissues.

"Development of new scaffolds for regenerative engineering and implementing them in contemporary medicine is of utmost importance—to my knowledge, bi-functional scaffolds imitating complex osteochondral tissue currently are not used in medical practice," says Miseviciute.

One of the components of the new composite is gelatine, a cheap product commonly used in culinary and cosmetic industry. This clear, hard and almost tasteless substance, obtained from animal collagen, is highly biologically compatible, biodegradable and has low antigenic properties; its modification possibilities are numerous.

The scaffolds were modeled by layering polymer combinations, and the porous structure of a scaffold was achieved by lyophilisation, i.e. freeze drying. Elemental analysis, bio imitational mineralisation, degradability and water absorption of the composite scaffold were among the parameters measured during the experiment. The tests have shown that the samples were highly hydrophilic, which suggests functionality of the scaffold.

"To create bi-functional scaffolds for human bone engineering, interdisciplinary knowledge of chemistry, biology, pharmacy, anatomy is being used. The new research is aiming to solve most urgent problems of today's ageing society. Although these experiments are just a beginning of a great endeavour, we are happy to be keeping pace with global tendencies," says Dr. Palaveniene.

Provided by Kaunas University of Technology