

Researchers: Eggshells can help grow, heal bones

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Gulden Camci-Unal, second from left, is leading a UMass Lowell team, including Xinchun Wu, that has determined eggshells inserted into a hydrogel mix can be used to strengthen bone grown in a laboratory for use in bone grafts and other procedures. Credit: Edwin Aguirre for UMass Lowell

Eggshells can enhance the growth of new, strong bones needed in medical procedures, a team of UMass Lowell researchers has

discovered.

The technique developed by UMass Lowell could one day be applied to repair bones in patients with injuries due to aging, accidents, cancer and other diseases or in military combat, according to Assistant Prof. Gulden Camci-Unal, who is leading the study.

Through the innovative process, crushed eggshells are inserted into a hydrogel mixture that forms a miniature frame to grow bone in the laboratory to be used for bone grafts. To do so, [bone cells](#) would be taken from the patient's body, introduced into this substance and then cultivated in an incubator before the resulting new bone is implanted into the patient.

The research demonstrates that when eggshell particles—which are primarily made of calcium carbonate—are incorporated into the hydrogel mixture, they increase bone cells' ability to grow and harden, which could potentially result in faster healing. And, because the bone would be generated from cells taken from the patient, the possibility the individual's immune system would reject the new material is greatly reduced, according to Camci-Unal.

The process could also be used to help grow cartilage, teeth and tendons, she said.

"This is the first study that uses eggshell particles in a hydrogel matrix for bone repair. We have already filed a patent for it and are very excited about our results. We anticipate the process can be adapted for use in many significant ways," said Camci-Unal, adding that one day, eggshell particles could also serve as a vehicle to deliver proteins, peptides, [growth factors](#), genes and medications to the body.

UMass Lowell students participating in the research include biomedical

engineering and biotechnology Ph.D. candidates Sanika Suvarnapathaki and Xinchun Wu of Lowell, along with Darlin Lantigua of Lawrence. Wu was the lead author of the team's research findings, which have been published in the academic journal *Biomaterials Science* and will be featured on the cover of the publication's print edition this month.

Using eggshells to support [bone](#) growth provides a sustainable way to reuse them while advancing the technology behind these procedures, according to the researchers.

"Global waste of discarded eggshells typically amounts to millions of tons annually from household and commercial cooking. By repurposing them, we can directly benefit the economy and the environment while providing a sustainable solution to unmet clinical needs," Camci-Unal said.

This is not the first time Camci-Unal has used an unconventional approach to design new materials for [biomedical engineering](#). Last year, she and her team used the principles behind origami—the ancient Japanese art of paper folding—as inspiration to build tiny 3-D structures where biomaterials can be grown in the lab to create new tissues.

Provided by University of Massachusetts Lowell

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