

IIT-Hyderabad researchers use eggshells to produce bone substitutes

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HYDERABAD: Researchers from the Indian Institute of Technology (IIT), Hyderabad, and NIT Jalandhar have developed a process by which bone implant materials — which are usually manufactured using synthetic materials that contain toxic elements — can now be synthesised using eggshells. A research paper on their findings has been published in a recent issue of the international journal, *Ceramics International*. The researchers seek to produce bone substitute materials such as β -tricalcium phosphate (β -TCP) using eggshells. Eggshells are mostly made of calcium-containing minerals, along with small amounts of proteins and water.

Roopavath Uday Kiran, the co-author of the research paper and a student of Department of Biomedical Engineering at IIT-Hyderabad, said: “There is always some hesitancy in using synthetic chemicals as bone replacement materials because of the presence of chemical

residues that are toxic. β -tricalcium phosphate (β -TCP), for example, is synthesised using nitrate compounds, which is present even in traces, could be dangerous.”

He added, “Bioceramics made using eggshell wastes are predicted to exhibit greater biocompatibility than other synthetic powders due to the presence of additional bioactive elemental ions inherently present in the eggshell. Eggshells are not only biocompatible but are also inexpensive and can be obtained in huge quantities; millions of tons of eggshells are dumped across the world.”

The researchers point out that usage of graft materials to heal bone defects has been known for a long time in India. The ancient Indian text, Sushruta Samhita, describes bone grafting method using materials having calcium, combined with the latex of banyan tree to form bone substitute. In modern times, damaged and missing bones are replaced with bone either from the patient, donor or using artificial materials containing calcium, such as Plaster of Paris or phosphate compounds.

The researchers synthesised pure and thermally stable β -TCP nanopowder from eggshells, fabricated scaffolds using these eggshell derived material and polymer and evaluated cellular response on the surface of these scaffolds. Their results show that eggshell derived bone substitute material is promising enough to replace commercially available β -TCP produced using harmful nitrate precursors and has the capability to develop implantable biomaterial for tissue regeneration.

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