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Korea develops innovative injectable adhesive hydrogel for bone regeneration

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Addressing the limitations of traditional bone grafts and adhesion methods



A research team from South Korea-based Pohang University of Science and Technology or POSTECH's Department of Chemical Engineering and Graduate School of Convergence Science and Technology, along with the Department of Chemical Engineering, has developed an innovative injectable adhesive hydrogel for bone regeneration.

This hydrogel utilises harmless visible light to simultaneously achieve cross-linking and mineralisation without the need for bone grafts.

Bone defects, which arise from various causes such as trauma, infection, and congenital abnormalities, are becoming increasingly common in ageing societies. Conventional treatments often involve bone grafts combined with serum or bioadhesives to fill the defect.

However, existing injectable hydrogels face challenges such as difficulty in maintaining their shape within the body and limited adhesive strength. Moreover, traditional methods using bone grafts with adhesive materials often fail to achieve simultaneous "bone regeneration" and "adhesion."

The POSTECH team has introduced a novel system that addresses these limitations. The newly developed hydrogel precursor comprises alginate (natural polysaccharide derived from brown algae), RGD peptide-containing mussel adhesive protein, calcium ions, phosphonodiols, and a photoinitiator. The coacervate-based formulation, which is immiscible in water, ensures that the hydrogel retains its shape and position after injection into the body. In experiments using animal models with femoral bone defects, the hydrogel was successfully injected, adhered accurately, and effectively delivered components essential for bone regeneration.