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Biomimetic coating of hydroxyapatite on glycerol phosphate-conjugated polyurethane via mineralization**Seol-Ha Jeong, Eun-Ho Song, Kyung-Il Cho and Hyoun-Ee Kim**
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Introduction & Aim: Polyurethane (PU) based biopolymers have been widely used in various medical fields due to a highly porous structure and controllable mechanical properties. However, it lacks biocompatibility compared to natural polymers. In order to improve the biological properties, hydroxyapatite (HA) has been widely used for coating on PU. However, as PU has no specific sites for interactions with hydrophilic coating layers, coating stability had not been achieved without any further processes. In this study, glycerol phosphate (gp) was introduced as a new conjugate to improve HA coating stability on PU.

Methodology: PU-gp-HA was fabricated by following 2 steps: (1) Glycerol phosphate conjugation and (2) HA mineralization. PU-gp was fabricated through foaming reaction. During this process, gp was conjugated with TDI based PU pre-polymer. Then, PU-gp was immersed in concentrated Simulated Body Fluid (SBF) solution to induce HA mineralization on the surface of PU-gp.

Findings: Glycerol phosphate was conjugated through urethane bonding with PU. Phosphate functional groups acted as nucleation sites for amorphous calcium phosphate in SBF solution to be anchored. Phosphate groups not only promoted HA nucleation, but also provided robust interface between PU and HA from exterior impacts. Most HA was detached from pure PU while large portion of HA remained on PU-gp after sonication. Filopodia of fibroblasts were well spread on PU-gp and PU-gp-HA than pure PU due to hydrophilic phosphate groups and bioactive HA. HA also activated fibroblasts' proliferation remarkably from 3 to 5 day of culturing time.

Conclusion: This study has demonstrated that elastomer modifying techniques using gp can induce homogeneous HA precipitation, enhance adhesion stability between PU and HA and improve the inherent biological properties of PU. It indicated a great potential for use in tissue engineering applications, including auricular cartilage replacement and bone regeneration scaffolds.

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