Human Platelet Lysate-functionalized Hydrogels as an Innovative approach for Bone Regeneration

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The potential for our bones to regenerate is greatly challenged by critical size bone defects, which also have a significant impact on the healing process and the functional outcome. To address these issues, bone implants are frequently utilized. The increased size of artificial scaffolds make it more difficult for biological components, vital nutrients, and cell ingrowth to be transported during the bio-integration stage.[1]

In this study, bio-interactive hydrogels which can potentially improve osseointegration of 3D-printed bone substitute scaffolds were developed. Human Platelet Lysate (PL) has cell-instructive and regenerative potential regarding bone regeneration and wound healing, Human Platelet Lysate (PL). In general, PL shows relatively weak mechanical properties, so we aimed for photopolymerizable derivatives.

Herein the successful novel modification of PL with allyl glycidyl ether (PLAGE) is reported. A variety of photocrosslinkable PL alternatives were synthesized and crosslinked, thereby improving the mechanical properties of the unmodified PL. Noteworthy, the formation of hydrogels was detected even without a thiol, suggesting that thiols in the PL backbone support gelation. Thorough characterization of the synthesized hydrogels via photorheology, swelling studies and preliminary in vitro experiments revealed promising results compared to literature-known relevant materials.[2] An in vivo preliminary test was conducted to investigate the degradation and inflammation grade of the most promising PL-based hydrogels. PL-derivatives present a promising new material platform for applications in the regenerative field.

References

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