UV-CROSSLINKED HUMAN PLATELET LYSATE – A NEW GENERATION OF HYDROGELS FOR BONE REGENERATION

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INTRODUCTION

Bone implants for critical-size bone defects often face challenges during regeneration, consequently influencing the patient's functional outcome. Bio-integration of the artificial implant is complicated with increasing defect size and the influence on biological processes, such as the transport of essential nutrients, biological factors, and cell ingrowth. [1]. Therefore, this study aimed to develop bio-interactive hydrogels to potentially improve osseointegration of 3D-printed bone substitute scaffolds. Human platelet lysate (PL) was chosen as the main building block due to its cell-instructive and regenerative potential regarding bone regeneration and wound healing. However, the PL exhibits weak mechanical properties, thus, efforts were made to develop photopolymerizable derivatives.

METHODS

PL was modified with photopolymerizable groups (*e.g.*, allyl glycidyl ether (PLAGE)) and compared to gelatin benchmark systems. Thiol ene chemistry was employed, and hydrogel characterization was performed *via* an extensive *in situ* photorheology, swelling and *in vitro* .study.

RESULTS

A library of photocrosslinkable PL derivatives was synthesized, and crosslinking was successfully performed. Hydrogel formation occurred with and without a thiol in the hydrogel formulation. PL is mainly based on serum albumin, with cysteine as the most abundant amino acid, suggesting that thiol groups in the protein backbone support gel formation.

DISCUSSION& CONCLUSIONS

A versatile hydrogel platform based on PL, with the potential for improved osseointegration of artificial bone implants, is presented. Gelation without a thiol has to be highlighted, which suggests that thiols in the PL backbone support crosslinking. For the 3D fabrication of bio-integration promoting hydrogel constructs, a suitable system is to be found by variation of parameters (modification, crosslinker, gel content, *e.g.*).

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REFERENCES

[1] Nauth *et al*. Critical-Size Bone Defects: Is There a Consensus for Diagnosis and Treatment? Journal of Orthopedic Trauma, 2018. 32.