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Hydrogelation of dextran-based polyampholytes with cryoprotective properties via click chemistry

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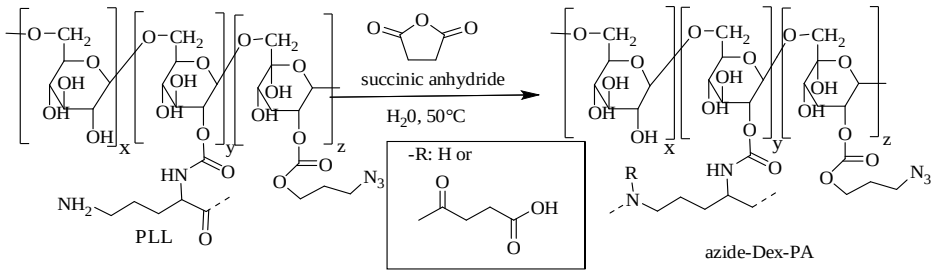
Hydrogels are promising substrates for tissue engineering applications because of their unique biocompatibility, flexible methods of synthesis, range of constituents, and desirable physical characteristics. Cryopreservation of cell-containing constructs using such hydrogel scaffolds is in high demand in tissue-engineering applications for the production of “off-the-shelf”tissue-engineered products. Here, I report a dextran-based polyampholyte hydrogel that itself shows cryoprotective properties, which could be useful for cell encapsulation and tissue engineering applications involving hydrogel formation. Amination was performed by introducing poly-L-lysine onto azide groups conjugated with dextran, and a portion of the amino groups was converted into carboxyl groups as shown in Scheme 1.



Scheme 1 Succinylation of azide-amino-dextran. SA reacted with the azide-amino-Dex, yielding the carboxylatedazide-amino-Dex (azide-Dex-PA).

These dextran-based polyampholytes showed good cryoprotective properties for mammalian cells, and addition of dextran substituted with dibenzylcyclooctyne acid induced *in situ* hydrogel formation via Cu-free click chemistry with high biocompatibility. Cells encapsulated with such *in situ* hydrogels can be cryopreserved well without addition of any cryoprotectants.

Keywords: Hydrogel, Cryopreservation, Dextran, Tissue engineering, Click chemistry