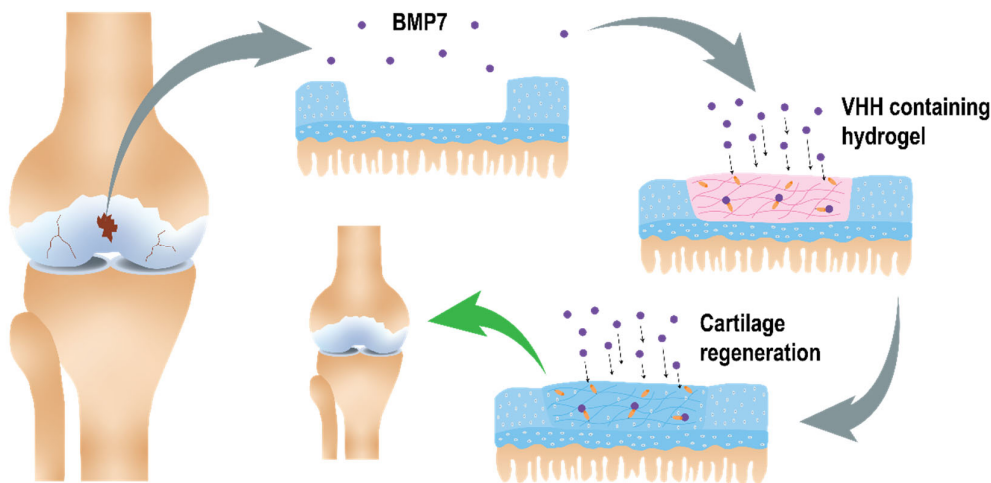


BMP7 attracting VHHs for improved cartilage repair in osteoarthritis

Project description

Bone morphogenetic protein 7 (BMP7) is an important growth factor for osteogenesis and chondrogenesis. Therefore, BMP7 could serve as a promising therapeutic for cartilage repair in osteoarthritis patients. In order to attract BMP7 from surrounding tissue, we developed a BMP7-targeting VHH (llama-derived small antibody). This VHH can be coupled to tyramine-functionalized dextran polymers for creating hydrogels. When injecting this hydrogel at the damaged cartilage site, it should promote chondrogenesis and restore the cartilage tissue.



Assignment

In previous work it has been shown that the VHHs have a high affinity and specificity for BMP7 and are able to release BMP7 after binding as well. Furthermore, there are established protocols for coupling the VHH to the dextran-tyramine polymer and preparing hydrogels from this polymer solution. In this master assignment the student will investigate whether these VHH-functionalized hydrogels are indeed improving chondrogenesis in vitro. This will be tested by culturing cells inside or on top of the VHH-functionalized hydrogels in the presence of BMP7. The effects of VHH concentration, VHH affinity and culturing protocol will have to be investigated. Next to that, release of BMP7 from the hydrogels over prolonged periods has to be tested. This should lead to established parameters for using these engineered hydrogels for cartilage repair in osteoarthritis.

Laboratory techniques involved

- VHH-polymer conjugation and evaluation of coupling efficiency and affinity, using SDS-PAGE and SPR
- Preparation of polymer hydrogels and performing in vitro release studies, using ELISA
- Cell culturing with hydrogels and performing luciferase reporter assays, using luciferase measurements and DNA quantification assays
- In vitro assessment of effect of VHH on BMP7 stimulation, using qPCR, immunohistochemical stainings and western blot.

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