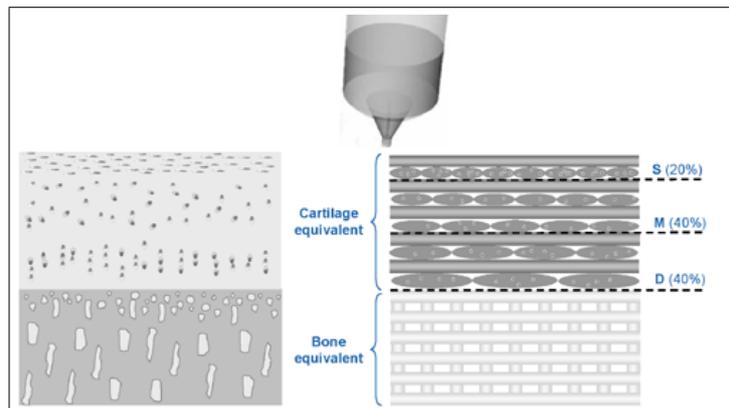


Implants for osteochondral repair using cell printing

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Cartilage tissue repair procedures currently under development, aim to create a “construct” that can be grown in a bio-reactor and that mimics the real tissue. The construct can consist of a scaffold made of strands of material that are set out into a 3D structure using printing technology. The material (a hydrogel/biomaterial mix) consists of a gel to provide mechanical stability and cells to create cartilaginous tissue. For complex tissues, such as cartilage, it may be necessary to construct a layered structure with the strands of material having different sizes and orientations at different places. See the figure below for a proposed architecture, where the cartilage equivalent contains three different layers of the cartilage.



The Study Group should concentrate on determining practical design criteria for the construct structure and bioreactor design that will ensure that the cells in the construct create a suitable distribution of cartilage. Central questions for the design are:

1. What is the best size and layout for the strands within the construct for good flow and nutrient transport while creating cartilage quickly.
2. How can the design be modified to avoid regions of low cartilage growth or low nutrient.
3. How quickly can the nutrients be pushed through the construct without significantly deforming or damaging the structure.

After the meeting, constructs will be manufactured and cultured in vitro based on the directions/outcomes of the MMSG. Experimental results obtained will subsequently be communicated to the mathematicians involved.

Further reading

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