

Tissue Engineering using Polymer Materials as Templates and Scaffolds

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Our research is attempting to develop technologies that promote the regeneration of human tissue, either in the laboratory or within the patient. This talk will explore the potential uses of polymers and colloids as tools to enhance the self-assembly of tissues.

Polymer materials and colloids are employed in tissue engineering to form a three-dimensional scaffold. Within the scaffold an environment must be created that stimulates cells to form tissue. In general there are 4 features or functions of a scaffold that can be tailored to encourage tissue regeneration:

- Surface interactions that mimic the role of the extracellular matrix.
- Architectural cues that promote spatial arrangement of cells.
- Chronic delivery of molecules that stimulate tissue regeneration.
- Biomechanical interactions that prevent physical damage to cells whilst conducting appropriate compressive forces or tensile strains.

There are many aspects of current scaffold technologies that are far from ideal. In part this is explained by the fact that we use materials and processes that were developed for other applications such as drug delivery. In the future the field needs multifunctional materials with nanometre and micrometer design features that enable the introduction of multiple biological signals. In addition, future scaffolds need to be easy to use in the clinic and economically viable to manufacture.