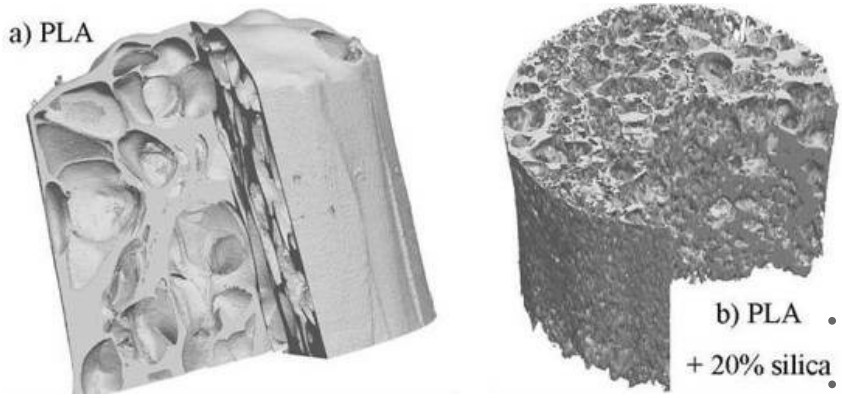
Tissue Repair

Tissue Repair Enhanced life expectancy in the UK has created significant demand for new strategies to replace diseased and damaged tissues. Many of the established methods to replace damaged tissues involve the use of the patient's own tissue or tissue harvested from a cadaver. Ethical issues associated with the application of tissue grafts and practical difficulties linked with the harvesting procedure (e.g. donor site morbidity, pain) have driven research into the development of novel approaches to repair damaged tissues, our current research in this area follows two major themes:

Tissue Engineering

The application of engineering and biological principles to the ex vivo and in vivo production of new tissues. Research in this area includes:

- Optimising the growth of mesenchymal stem cells for use in the replacement of damaged cartilage.
- Determining the influences of mechanical load and interactions with pericellular matrices on the behaviour of chondrocytes (cartilage producing cells).
- The encapsulation of cells in hydrogel matrices for tissue engineering both hard and soft tissues.
- Optimising processing methods for the production of novel scaffolds.



3D reconstructions of PLA scaffolds for bone tissue engineering

Synthetic Replacements

This involves the application of materials to act as a filler and support the tissue healing process. As our knowledge of biological systems improves we are moving from the use of materials as crude compositional mimics to designing materials that can interact with specific biological processes to enhance tissue formation. Projects in this area include:

- The design of bioresponsive materials that can degrade in response to tissue formation.
- The formulation of new resorbable cement formulations for the replacement of bone.
- The use of ceramic matrices in the delivery of biological molecules and drugs.

Scanning electron micrographs of calcium phosphate cement matrices, used to replace diseased and damaged bone

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