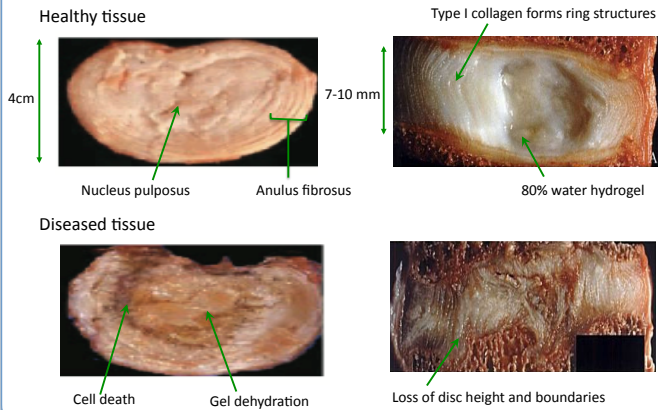


# 3D Materials for Bioengineered Tissue Replacements

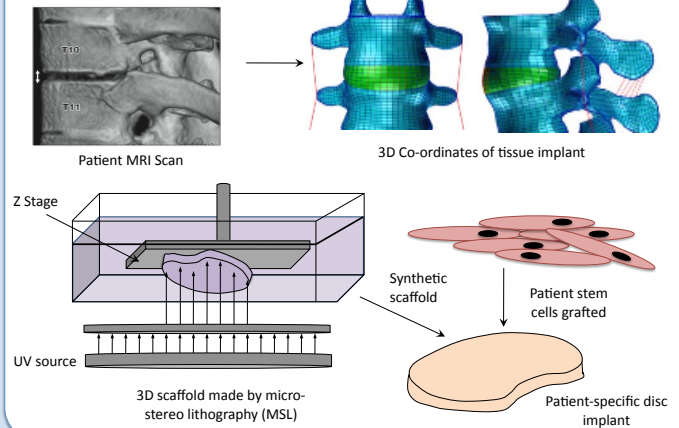
Claire Dow<sup>1</sup> supervised by Andrew Dove<sup>2</sup>, Department of Chemistry

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## 1. Intervertebral back disc degeneration is a major cause of lower back pain



## 2. Engineering of a replacement tissue implant is the treatment goal

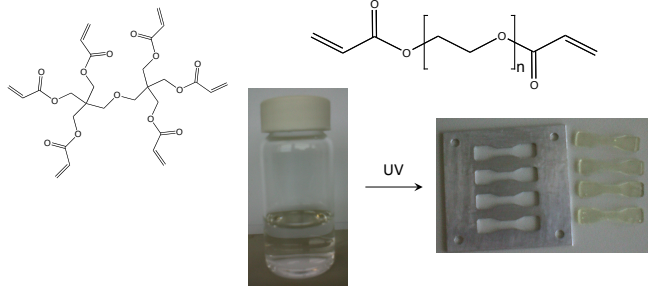


## 3. Materials currently used in micro-stereolithography are non-degradable

Key scaffold properties:

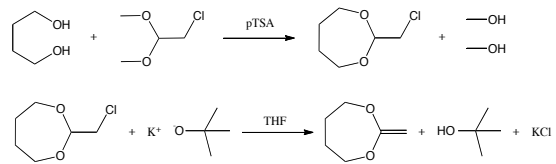
1. Tensile strength  2. Biocompatible  3. Degradable

Hexa-acrylate crosslinker + Poly(ethylene glycol) diacrylate (PEG D.A)



## 4. Ketene acetals were blended adding degradable ester bonds to the materials

Ketene acetal synthesis



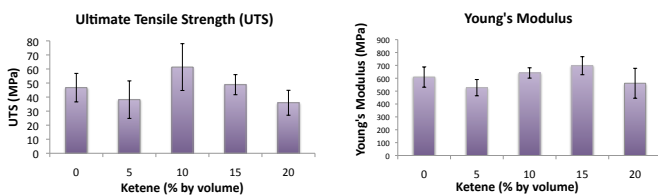
Monomer blending percentage by volume

| Ketene acetal (%) | PEG D.A. (%) | Crosslinker (%) |
|-------------------|--------------|-----------------|
| 0                 | 80           | 20              |
| 5                 | 75           | 20              |
| 10                | 70           | 20              |
| 15                | 65           | 20              |
| 20                | 60           | 20              |

## 5. Tensile strength and biocompatibility are retained

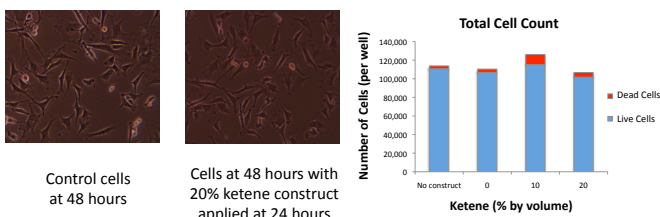
Key scaffold properties:

1. Tensile strength  2. Biocompatible  3. Degradable

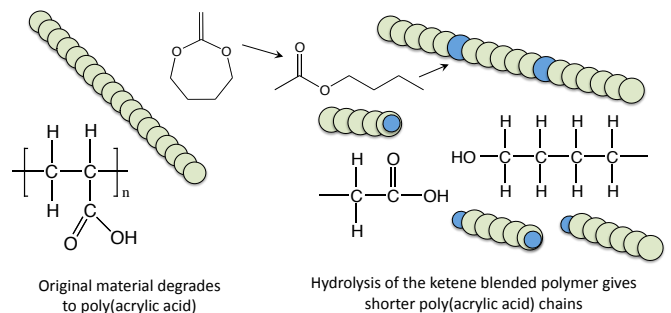


Key scaffold properties:

1. Tensile strength  2. Biocompatible  3. Degradable



## 6. Basic hydrolysis revealed that the original material was in fact degradable



## Acknowledgements

Many thanks to the Dove group, particularly Dr. Andrew Dove and Dr. Ian Barker, also to Dr. Simon Leigh and Marina Talib in the Department of Engineering, University of Warwick, and to Dr. Hamish Gilbert and Dr. Stephen Richardson in the School of Biomedicine, University of Manchester.

## References

- Urban and Roberts (2003) Arthritis Res Ther, 5:120-130.
- Adams et al., (2007) Biomechanics of Backpain, 2<sup>nd</sup> Edition.
- Campagna et al., (2009) AJR Am J Roentgenol 192(4):987-95.
- Rohlmann et al., (2009) Eur Spine J. 18:89-97.