

## Tissue engineered, scaffold free, human cartilage sheets

**Thomas J Kean and Dennis J. E.**  
Benaroya Research Institute, USA

**W**e have developed a method to expand human chondrocytes whilst retaining their differentiation capacity. Expanded cells are then grown in differentiation media on bioreactors, forming clinical scale cartilage sheets.

**Methods:** Porcine synovial tissue was isolated and used at passage 2 to form synoviocyte matrix on tissue culture plastic. Cells were extracted from the matrix using dry ice cooled ethanol. Ethanol extracted synoviocyte matrix coated flasks were used to culture human chondrocytes at low O<sub>2</sub> (5%) compared with cells that were cultured on tissue culture plastic (Uncoated). Cells (70 x 10<sup>6</sup>) were then seeded in 4x4cm bioreactors and grown for 1 month (21% O<sub>2</sub>, normoxic) and subjected to biomechanical testing. Cells were also made into aggregates (0.25 x 10<sup>6</sup>/ aggregate) and assessed for glycosaminoglycan (GAG), DNA and hydroxyproline (HP, analogous to collagen) content.

**Results:** Significantly more population doublings were achieved on coated flasks vs tissue culture plastic at both low and normoxic oxygen conditions.

Despite having undergone significantly more population doublings, the GAG/DNA and the HP/DNA were not significantly different to aggregates grown from cells expanded on tissue culture plastic at either low or normoxic O<sub>2</sub>. Due to the paucity of cells from tissue culture plastic, 4x4cm sheets could not be made.

**Conclusion:** Ethanol extracted synoviocyte matrix significantly enhances the growth of human chondrocytes, enabling sufficient cell numbers to be achieved from a limited cell source to produce clinical scale tissue engineered human cartilage sheets.

### Biography

Thomas Kean completed his PhD at Cardiff University, Wales, UK in 2006. Since then, he has held a Post-Doctoral Research Associate position at Case Western Reserve University in Cleveland and is currently a Senior Post-Doctoral Research Associate at the Benaroya Research Institute in Seattle. His research has combined diverse fields of tissue engineering science, including peptide-targeted adult stem cells, differentiation of adult stem cells, and cartilage biomechanics.

tkean@benaroyaresearch.org