**Juvenile Chondrocytes: Novel Alternatives for Allogeneic Cell Therapy?**

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**Purpose**

Development of novel allogeneic chondrocyte therapies are needed to provide a more widespread, cost-effective cartilage treatment option. Here we investigate the potential of juvenile cartilage sources for allogeneic chondrocyte manufacture.

**Methods and Materials**

Juvenile polydactyly digit (PD; n=4; aged 1±1 years (med±IQR)) or iliac apophysis cartilage (IA; n=6; aged 1±0.5years (med±IQR)) was used to derive chondrocyte cultures. Juvenile chondrocyte growth was compared to adult chondrocytes used for Autologous Chondrocyte Implantation (n=11; aged 41±9 years (med±IQR)). Further, juvenile chondrocytes (PD, n=2; IA, n=3) were up-scale manufactured using the Quantum® hollow-fibre bioreactor and compared to traditional tissue culture plastic (TCP) methods. All data are mean±SD.

**Results**

Comparable chondrocyte yields were obtained from juvenile (IA: 4.3±3.8x103 cells/mg tissue; polydactyly: 4.2±4.2x103 cells/mg tissue) and adult (2.6±0.1x103 cells/mg tissue; p>0.05; One-Way Anova) sources. In contrast, doubling time (DT) (passage 1-3) for PD chondrocytes grown on TCP (2.66±1.57days) was significantly lower than IA (5.17±2.66 days) and adult chondrocytes (9.98±10.29 days) (Paired t-tests; p<0.05). Up-scale bioreactor expansion yielded 74.5±30 x106 PD and 76±14x106 IA chondrocytes in 11±1 days. DT was longer in the bioreactor cf. TCP (IA: bioreactor DT= 3.9±0.2 days, TCP DT= 2.0±0.3 days, t-test, p<0.05; PD: bioreactor DT=3.8±1.0 days, TCP DT=1.3±0.0 days). Juvenile chondrocytes were immunopositive (>95%) for CD90, CD73, CD44, CD166 and CD151 and immunonegative (<2%) for CD19, CD34, and CD45 and no difference in immunoprofile was observed cf. TCP expansion (One-Way ANOVA).

**Conclusions**

Juvenile chondrocytes represent attractive allogeneic cells sources, yielding large numbers of chondrocytes. However, our preliminary analyses indicate that their growth may be slowed upon hollow-fibre bioreactor expansion. Further analysis of key chondrogenic genes and *in vitro* cartilage forming capacity needs to be conducted in more donors to determine whether chondrogenic potential is influenced by up-scale manufacture.