

Description of Additional Supplementary Files

File Name: Supplementary Data 1

Description: Genes significantly differentially expressed between 17 WPC BMPR1B- and BMPR1B+ presumptive articular chondrocytes. Positive sign indicates enrichment in BMPR1B- cells.

File Name: Supplementary Data 2

Description: Gene modules defined by WGCNA performed on fetal 17 WPC tissues.

File Name: Supplementary Data 3

Description: Expression levels (transcripts per million, TPM) for membrane proteins and transcription factors as well as GO terms enriched in the yellow (chondrocyte) module.

File Name: Supplementary Data 4

Description: Expression levels (transcripts per million, TPM) for membrane proteins and transcription factors as well as GO terms enriched in the green (ligamentocyte) module.

File Name: Supplementary Data 5

Description: Expression levels (transcripts per million, TPM) for membrane proteins and transcription factors as well as GO terms enriched in the turquoise (myoblast) module.

File Name: Supplementary Data 6

Description: Expression levels (transcripts per million, TPM) for membrane proteins and transcription factors as well as GO terms enriched in the brown (osteoblast) module.

File Name: Supplementary Data 7

Description: Expression levels (transcripts per million, TPM) for membrane proteins and transcription factors as well as GO terms enriched in the blue (tenocyte) module.

File Name: Supplementary Data 8

Description: Transcription factor binding motifs enriched in week 17 WGCNA modules using OPPOSSUM. Z scores and Fisher scores as measures of significance are listed.

File Name: Supplementary Data 9

Description: Gene modules defined by WGCNA performed across 4 stages of human cartilage ontogeny.

File Name: Supplementary Data 10

Description: Genes significantly differentially enriched in Fetal 17 WPC vs. Adolescent chondrocytes ($p < 0.01$). Negative sign indicates enrichment in fetal cells.

File Name: Supplementary Data 11

Description: Genes significantly differentially enriched in Adolescent vs. Fetal 17 WPC chondrocytes ($p < 0.01$). Positive sign indicates enrichment in adolescent cells.

File Name: Supplementary Data 12

Description: Genes significantly differentially enriched in Adolescent vs. Adult chondrocytes ($p < 0.01$). Positive sign indicates enrichment in adolescent cells.

File Name: Supplementary Data 13

Description: Genes significantly differentially enriched in Adult vs. Adolescent chondrocytes ($p < 0.01$). Negative sign indicates enrichment in adult cells.

File Name: Supplementary Data 14

Description: Genes significantly differentially enriched in Fetal 17 WPC vs. Adult chondrocytes ($p < 0.05$). Positive sign indicates enrichment in fetal cells.

File Name: Supplementary Data 15

Description: Genes significantly differentially enriched in embryonic 5-6 WPC vs. fetal 17 WPC chondrocytes ($p < 0.05$). Negative sign indicates enrichment in embryonic cells.

File Name: Supplementary Data 16

Description: Transcription factor binding motifs enriched across human cartilage ontogeny using OPPOSSUM. Z scores and Fisher scores as measures of significance are listed.

File Name: Supplementary Data 17

Description: Genes significantly differentially enriched in Mouse vs. Human chondrocytes ($p < 0.01$). Positive sign indicates enrichment in mouse cells.

File Name: Supplementary Data 18

Description: Genes significantly differentially enriched in Human vs. Mouse chondrocytes ($p < 0.01$). Negative sign indicates enrichment in human cells.

File Name: Supplementary Data 19

Description: Genes significantly differentially expressed in d14 PSC-derived vs. d60 PSC-derived chondrocytes ($p < 0.05$). Negative sign indicates enrichment in d14 cells.

File Name: Supplementary Data 20

Description: Genes significantly differentially enriched in adult pig ITGA4⁻BMPR1B⁻ articular chondrocytes vs. CD146⁺ synovial pericytes ($p < 0.05$). Positive sign indicates enrichment in ITGA4⁻BMPR1B⁻ cells.

File Name: Supplementary Data 21

Description: Genes significantly differentially enriched in adult pig ITGA4⁻BMPR1B⁺ articular chondrocytes vs. CD146⁺ synovial pericytes ($p < 0.05$). Positive sign indicates enrichment in ITGA4⁻BMPR1B⁺ cells.

File Name: Supplementary Data 22

Description: Genes significantly differentially enriched in adult pig ITGA4⁺BMPR1B⁻ articular chondrocytes vs. CD146⁺ synovial pericytes ($p < 0.05$). Positive sign indicates enrichment in ITGA4⁺BMPR1B⁻ cells.

File Name: Supplementary Data 23

Description: Genes significantly differentially enriched in adult pig ITGA4⁺BMPR1B⁺ articular chondrocytes vs. CD146⁺ synovial pericytes ($p < 0.05$). Positive sign indicates enrichment in ITGA4⁺BMPR1B⁺ cells.

File Name: Supplementary Data 24

Description: Genes significantly differentially enriched in adult pig ITGA4⁻BMPR1B⁺ vs. ITGA4⁻BMPR1B⁻ articular chondrocytes ($p < 0.05$). Positive sign indicates enrichment in ITGA4⁻BMPR1B⁺ cells.

File Name: Supplementary Data 25

Description: Genes significantly differentially enriched in adult pig ITGA4⁺BMPR1B⁻ vs. ITGA4⁻BMPR1B⁻ articular chondrocytes ($p < 0.05$). Positive sign indicates enrichment in ITGA4⁺BMPR1B⁻ cells.

File Name: Supplementary Data 26

Description: Genes significantly differentially enriched in adult pig ITGA4⁺BMPR1B⁺ vs. ITGA4⁻BMPR1B⁻ articular chondrocytes ($p < 0.05$). Positive sign indicates enrichment in ITGA4⁺BMPR1B⁺ cells.

File Name: Supplementary Data 27

Description: Genes significantly differentially enriched in adult pig ITGA4⁺BMPR1B⁻ vs. ITGA4⁻BMPR1B⁺ articular chondrocytes ($p < 0.05$). Positive sign indicates enrichment in ITGA4⁺BMPR1B⁻ cells.

File Name: Supplementary Data 28

Description: Genes significantly differentially enriched in adult pig ITGA4⁺BMPR1B⁺ vs. ITGA4⁻BMPR1B⁺ articular chondrocytes ($p < 0.05$). Positive sign indicates enrichment in ITGA4⁺BMPR1B⁺ cells.

File Name: Supplementary Data 29

Description: Genes significantly differentially enriched in adult pig ITGA4⁺BMPR1B⁻ vs. ITGA4⁺BMPR1B⁺ articular chondrocytes ($p < 0.05$). Positive sign indicates enrichment in ITGA4⁺BMPR1B⁻ cells.

File Name: Supplementary Data 30

Description: Genes present in each chromatin state in fetal 17 WPC chondrocytes. Active promoter = H3K4me4, H3K27Ac; Promoter proximal = H3K4me1, H3K4me3 and H3K27Ac; Polycomb repressed = H3K27me3.

File Name: Supplementary Data 31

Description: Genes present in each chromatin state in adult articular chondrocytes. Active promoter = H3K4me4, H3K27Ac; Promoter proximal = H3K4me1, H3K4me3 and H3K27Ac; Polycomb repressed = H3K27me3.

File Name: Supplementary Data 32

Description: Genes present in each chromatin state in d14 PSC-derived chondrocytes. Active promoter = H3K4me4, H3K27Ac; Promoter proximal = H3K4me1, H3K4me3 and H3K27Ac; Polycomb repressed = H3K27me3.

File Name: Supplementary Data 33

Description: Genes present in each chromatin state in d60 PSC-derived chondrocytes. Active promoter = H3K4me4, H3K27Ac; Promoter proximal = H3K4me1, H3K4me3 and H3K27Ac; Polycomb repressed = H3K27me3.

File Name: Supplementary Data 34

Description: Genes, and GO terms, enriched commonly in fetal 17 WPC chondrocytes vs. embryonic 5-6 WPC pre-chondrocytes and d60 vs. d14 PSC-derived chondrocytes.

File Name: Supplementary Data 35

Description: Genes, and GO terms, enriched commonly in embryonic 5-6 WPC pre-chondrocytes vs. fetal 17 WPC chondrocytes and d14 vs. d60 PSC-derived chondrocytes.

File Name: Supplementary Data 36

Description: Metrics for samples sequenced including total reads and mapped reads.