**Supplementary Figures**

**Supplemental Figure 1 –** Enrichment of GO pathways with differentially expressed genes in the liver between Stage 2 Autumn Juveniles and Stage 4 Spring Adults. Prior to Benjamini-Hochberg correction, seven pathways were significantly enriched including Cytokine-cytokine receptor interaction (p<0.01) and Adipocytokine signaling pathway (p=0.03).

**Chart

Description automatically generated**

**Supplemental Figure 2** - **(A)** Determining the soft threshold that reduces spurious connectivity between genes by maximizing model fit (left) while saturating mean connectivity. **(B)** Fuzzy cmeans hierarchical clustering of our topological overlap matrix (dissimilarity distances) which identified 37 gene modules after combining modules with similar eigengene values and filtering module with less than 30 genes.

**Text, whiteboard

Description automatically generated**

**Supplemental Figure 3 A)** Calculating the soft threshold that maximizes model fit (left) while saturating mean connectivity (right) for hippocampal networks. **(B)** Fuzzy cmeans hierarchical clustering of our topological overlap matrix (dissimilarity distances) identified 37 gene modules after combining and filtering modules.

**Application

Description automatically generated with medium confidence**

**Supplemental Figure 4 – In the hippocampus,** 1300 gene expression profiles formed 11 distinct clusters excluding stage 1 data. Of the genes found to be differentially expressed between Stage 4 and 2, most differentially expressed genes were in Cluster 3 and Cluster 11. These clusters show transient up and down regulation, suggesting potential involvement in seasonal expression changes. In the cortex, 940 passed filters and clustered into 12 distinct clusters. Most of the high effect differentially expressed genes from the cortex grouped in Clusters 1 and 11, which showed a gradual increase in expression through the life cycle in Cluster 1, while genes in Cluster 11 were permanently downregulated between Stage 2 (Brain Shrinkage) and Stage 3 (Brain Minimum), differing from the pattern of shrinkage in the hippocampus. The pattern differences may be associated with the limited regrowth occurring in the cortex.

**Graphical user interface, application

Description automatically generated**