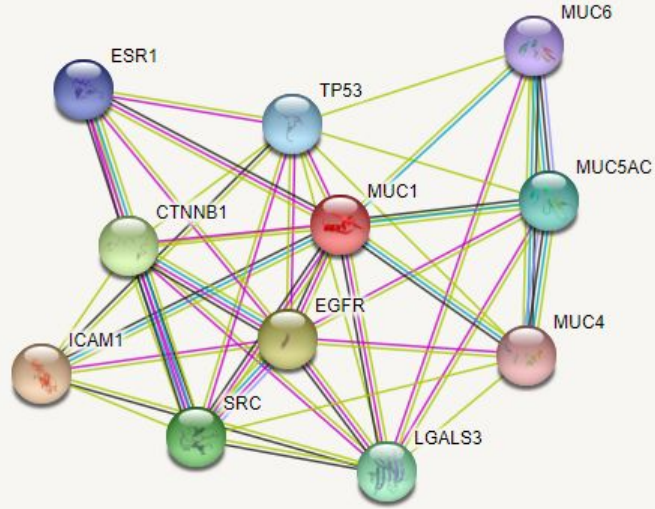
(A)

Name	P-value	Adjusted p-value	Odds Ratio	Combined score
Interleukin-11 pathway	0.001150	0.003250	19977.00	135204.64
Termination of O-glycan biosynthesis	0.001300	0.003250	19974.00	132735.46
O-linked glycosylation of mucins	0.003150	0.005250	19937.00	114844.47
Post-translational protein modification	0.009800	0.01225	19804.00	91601.09
Protein metabolism	0.02210	0.02210	19558.00	74558.71

(B)

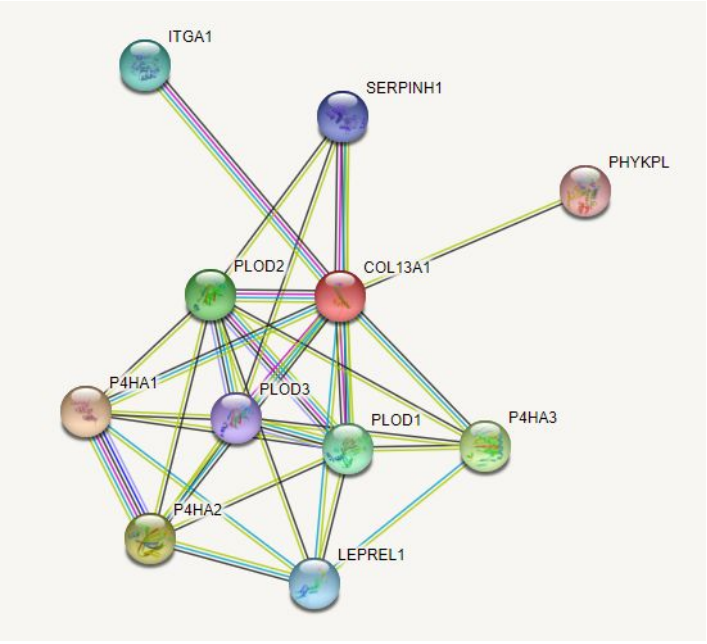


Supplementary Figure 1

(A)

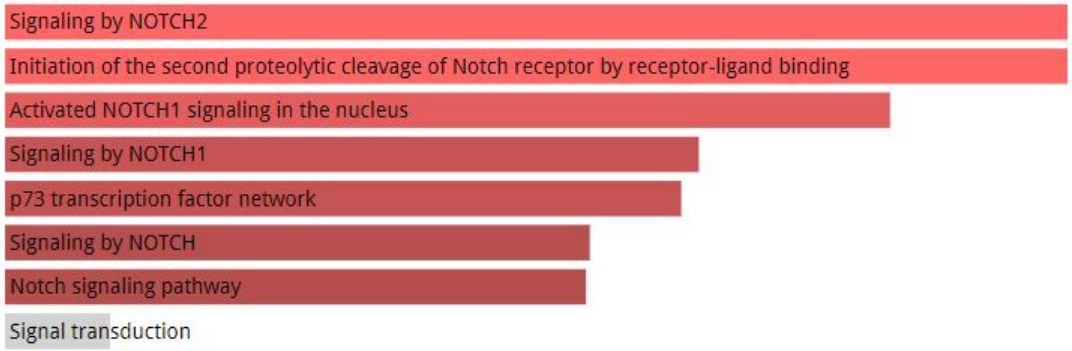
Name	P-value	Adjusted p-value	Odds Ratio	Combined score
Syndecan 1 pathway	0.002300	0.004650	19954.00	121217.83
Collagen biosynthesis and modifying enzymes	0.003200	0.004650	19936.00	114524.75
Integrins in angiogenesis	0.003700	0.004650	19926.00	111574.39
Extracellular matrix organization	0.004650	0.004650	19907.00	106918.54

(B)



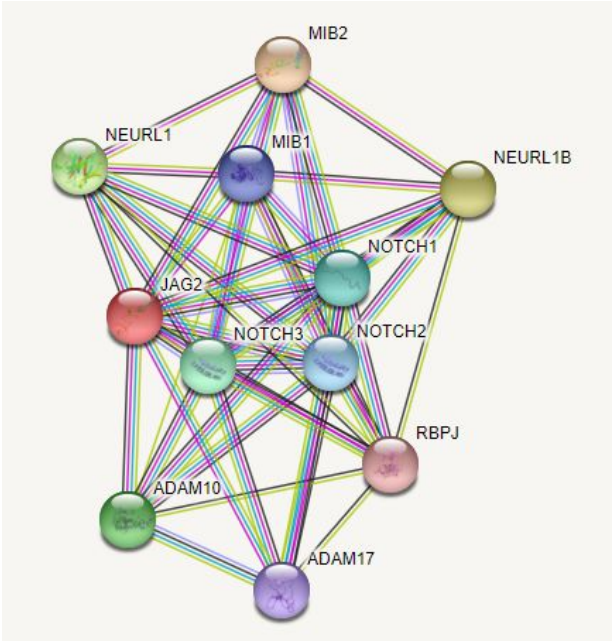
Supplementary Figure 2

(A)



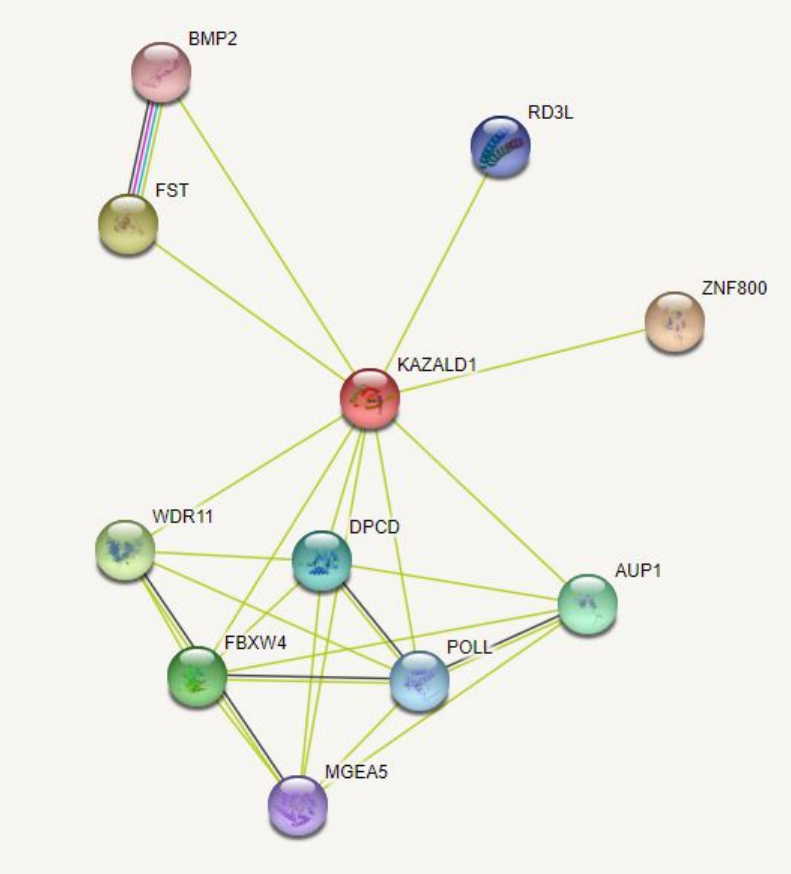
Name	P-value	Adjusted p-value	Odds Ratio	Combined score
Signaling by NOTCH2	0.0007000	0.002800	19986.00	145187.41
Initiation of the second proteolytic cleavage of Notch receptor by receptor-ligand binding	0.0007000	0.002800	19986.00	145187.41
Activated NOTCH1 signaling in the nucleus	0.001550	0.004133	19969.00	129189.85
Signaling by NOTCH1	0.003650	0.006320	19927.00	111851.11
p73 transcription factor network	0.003950	0.006320	19921.00	110243.90
Signaling by NOTCH	0.005950	0.006914	19881.00	101877.73
Notch signaling pathway	0.006050	0.006914	19879.00	101536.16
Signal transduction	0.05100	0.05100	18980.00	56483.22

(B)

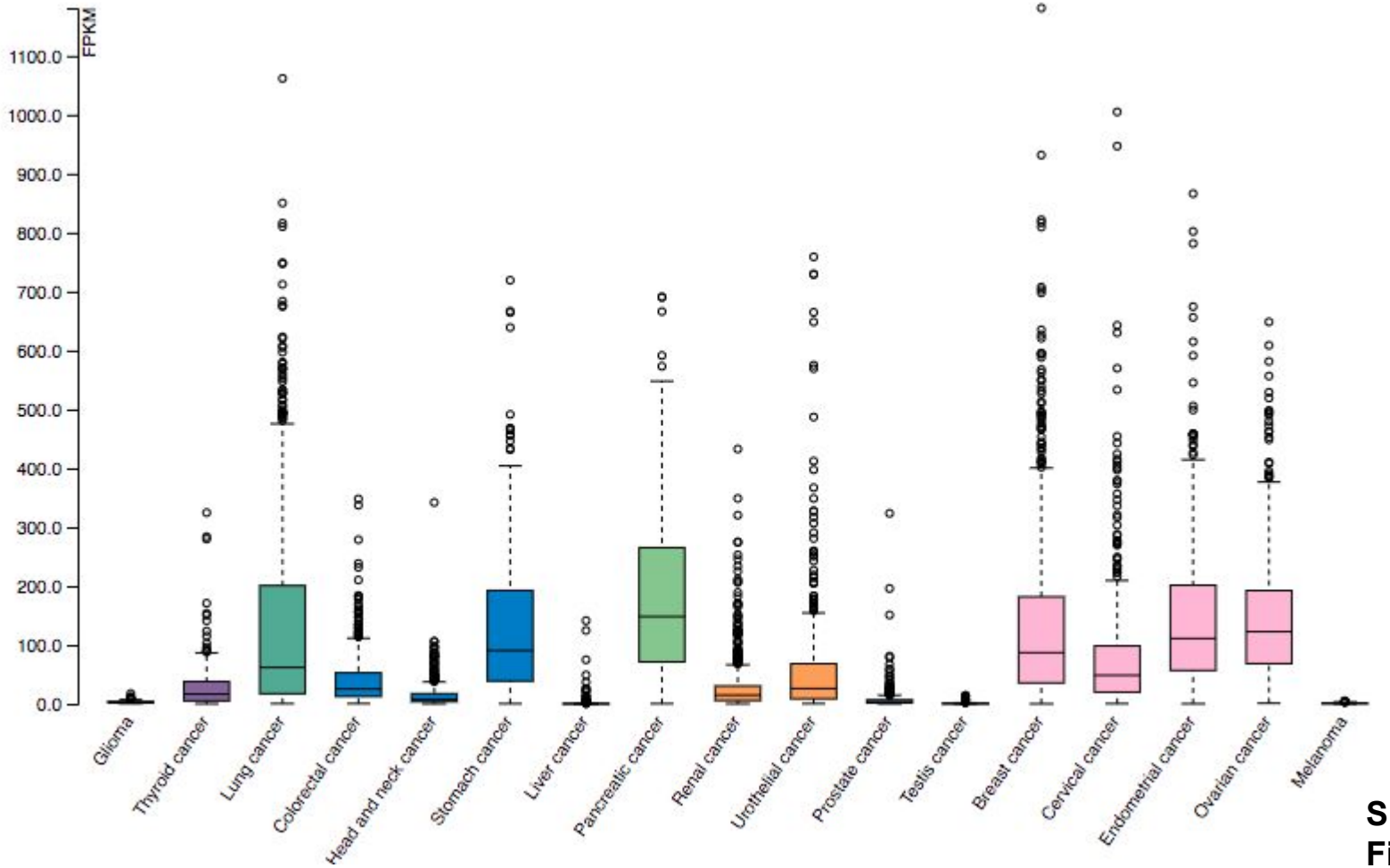


Supplementary Figure 3

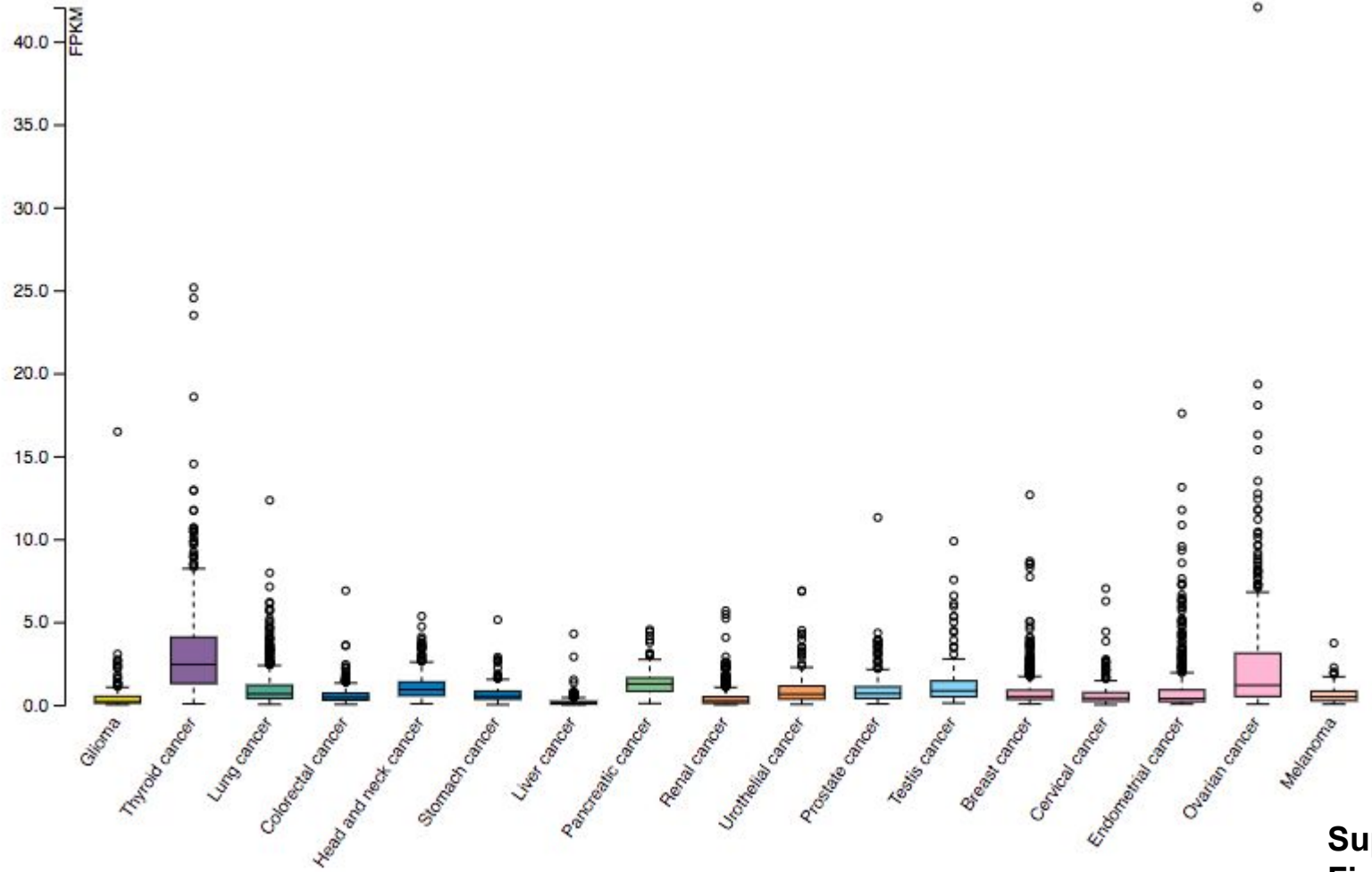
(A)



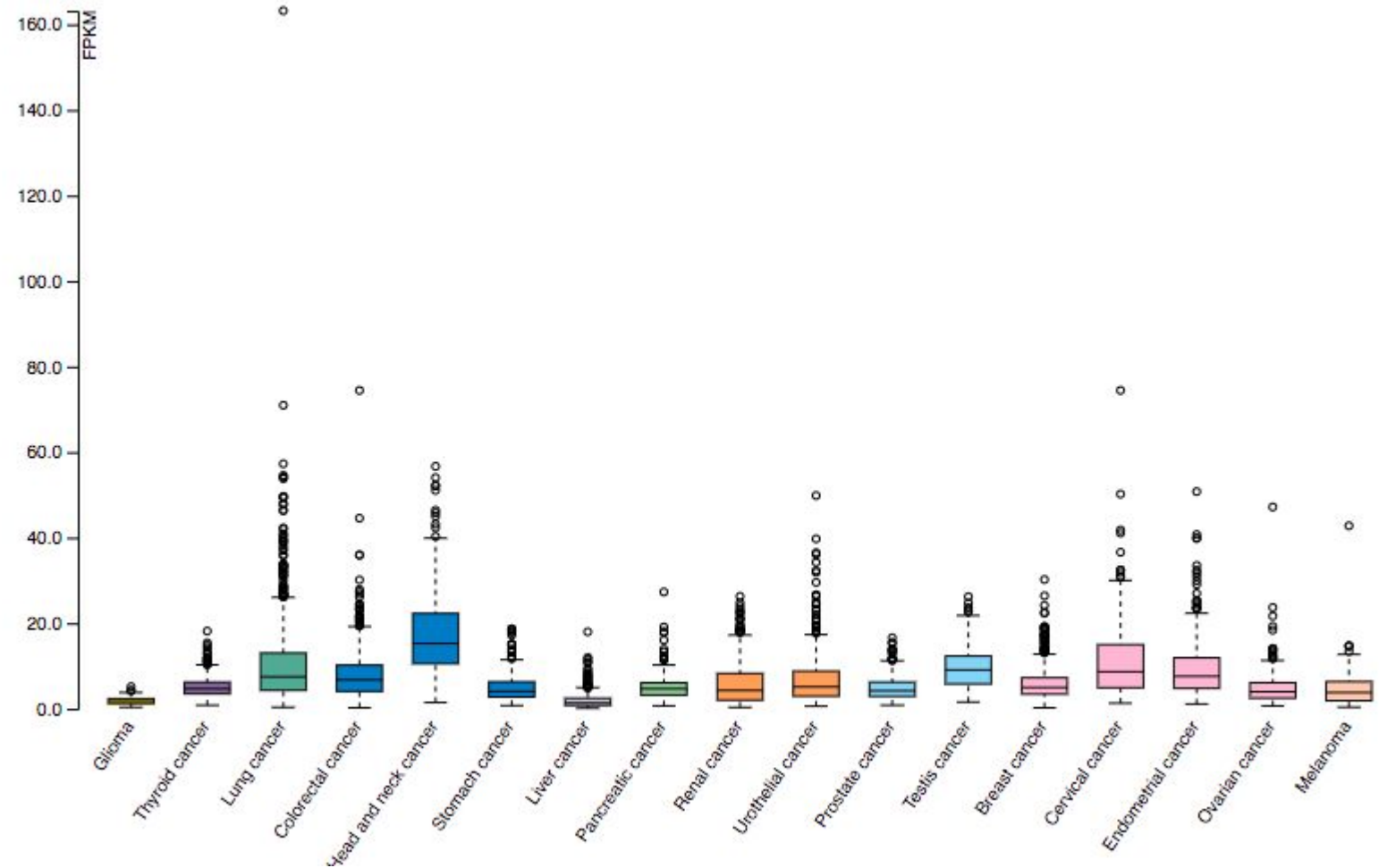
Supplementary Figure 4



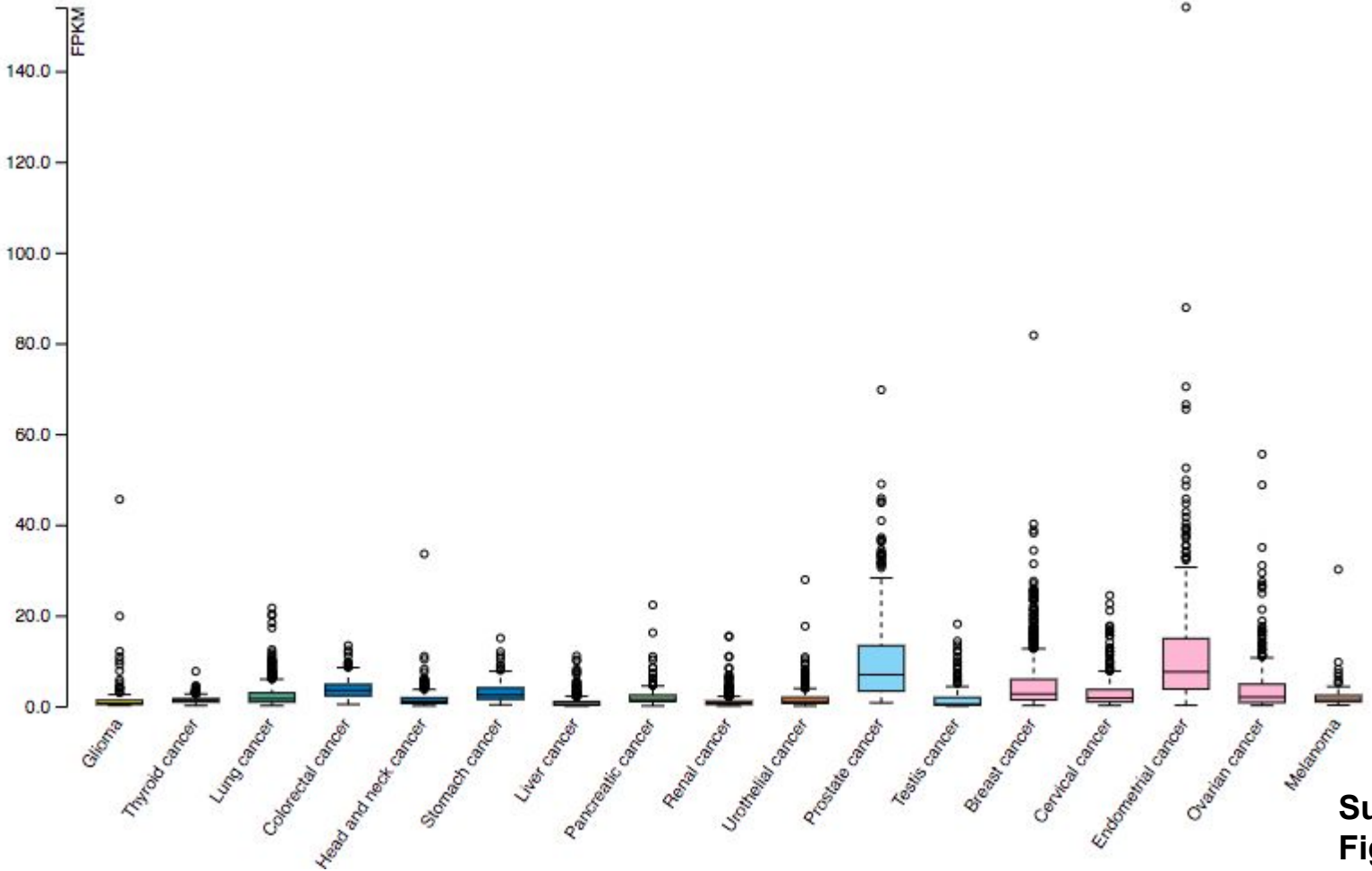
Supplementary Figure 5



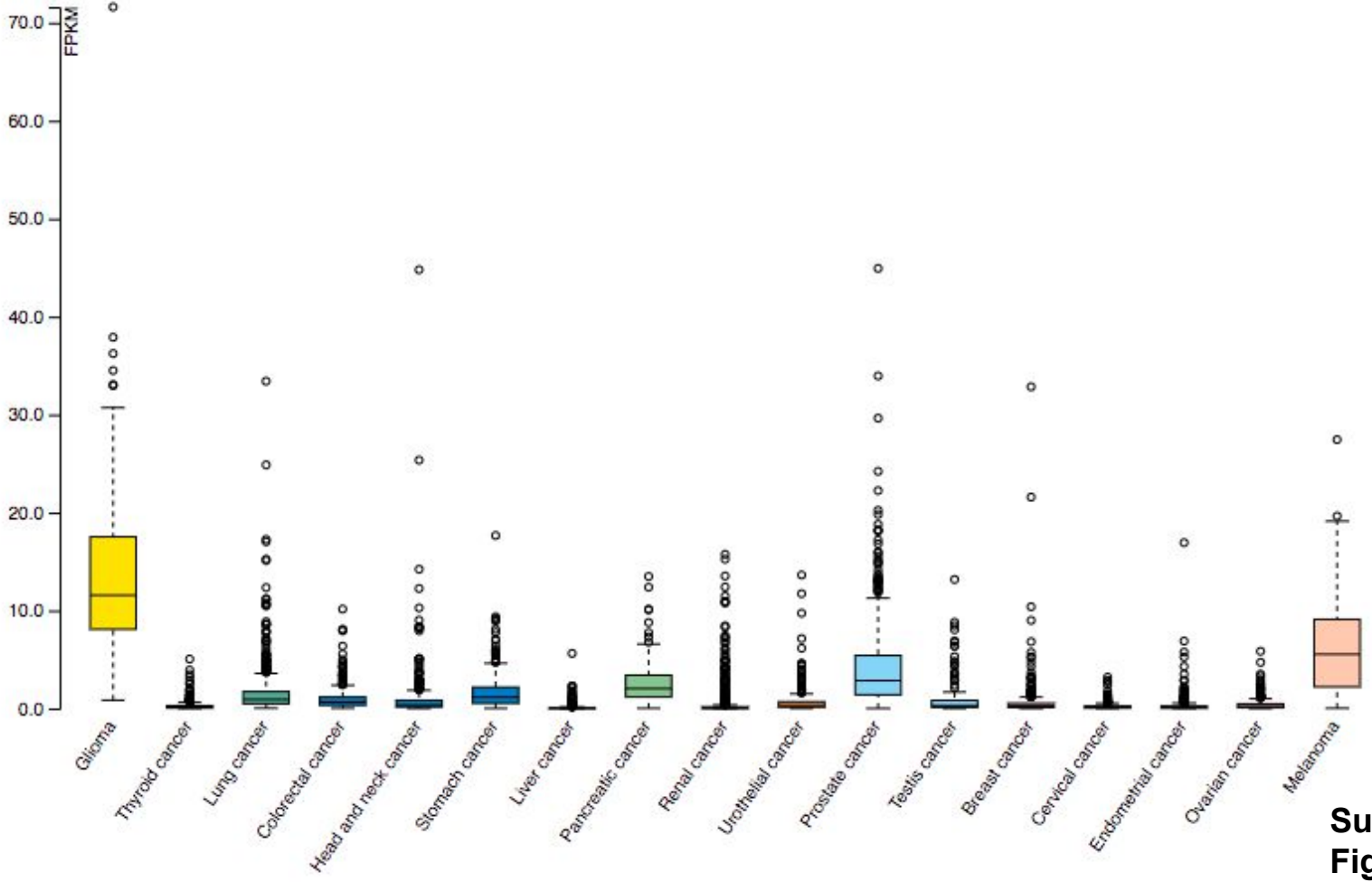
Supplementary Figure 6



Supplementary Figure 7



Supplementary Figure 8



Supplementary Figure 9

Supplementary Figure 1. Functional enrichment analysis of differentially expressed gene, *MUC1*. (A) Significantly enriched terms. Lighter colour represents more significance (smaller p value). (B) Network map of differentially expressed gene *MUC1*. Network nodes and edges indicate proteins and their interactions. Filled network nodes indicate a 3D structure is known.

Supplementary Figure 2. Functional enrichment analysis of differentially expressed gene, *COL13A1*. (A) Significantly enriched terms. Lighter colour represents more significance (smaller p value). (B) Network map of differentially expressed gene *COL13A1*. Network nodes and edges indicate proteins and their interactions. Filled network nodes indicate a 3D structure is known.

Supplementary Figure 3. Functional enrichment analysis of differentially expressed gene, *JAG2.* (A) Enriched terms. Lighter red colour represents more significance (smaller p value). Grey colour represents non-significant enrichment terms (B) Network map of differentially expressed gene *JAG2*. Network nodes and edges indicate proteins and their interactions. Filled network nodes indicate a 3D structure is known.

Supplementary Figure 4. Functional enrichment analysis of differentially expressed gene, *KAZALD1*. (A) Network map of differentially expressed gene *KAZALD1*. Network nodes and edges indicate proteins and their interactions. Filled network nodes indicate that a 3D structure is known.

Supplementary Figure 5. Boxplots of *MUC1* mRNA expression levels in 17 different cancer tissues.

Retrieved from The Human Protein Atlas

Supplementary Figure 6. Boxplots of *COL13A1* mRNA expression levels in 17 different cancer tissues.

Retrieved from The Human Protein Atlas

Supplementary Figure 7. Boxplots of *JAG2* mRNA expression levels in 17 different cancer tissues.

Retrieved from The Human Protein Atlas

Supplementary Figure 8. Boxplots of *KAZALD1* mRNA expression levels in 17 different cancer tissues.

Retrieved from The Human Protein Atlas

Supplementary Figure 9. Boxplots of *LSAMP* mRNA expression levels in 17 different cancer tissues.

Retrieved from The Human Protein Atlas

List of p values for pairwise comparisons of *MUC1* expression levels between OS cell types.

***MUC1* pairwise comparisons**	**P Value**
B cells vs. Carcinoma associated fibroblasts	0.7649
B cells vs. Endothelial cells	>0.9999
B cells vs. Myeloid cells 1	>0.9999
B cells vs. Myeloid cells 2	0.9999
B cells vs. NK/T cells	>0.9999
B cells vs. Osteoblastic OS cells	<0.0001
B cells vs. Osteoclasts	>0.9999
B cells vs. Plasmocytes	0.8032
Carcinoma associated fibroblasts vs. Endothelial cells	0.6674
Carcinoma associated fibroblasts vs. Myeloid cells 1	0.2073
Carcinoma associated fibroblasts vs. Myeloid cells 2	0.6563
Carcinoma associated fibroblasts vs. NK/T cells	0.1587
Carcinoma associated fibroblasts vs. Osteoblastic OS cells	<0.0001
Carcinoma associated fibroblasts vs. Osteoclasts	0.3029
Carcinoma associated fibroblasts vs. Plasmocytes	>0.9999
Endothelial cells vs. Myeloid cells 1	>0.9999
Endothelial cells vs. Myeloid cells 2	0.9995
Endothelial cells vs. NK/T cells	>0.9999
Endothelial cells vs. Osteoblastic OS cells	<0.0001
Endothelial cells vs. Osteoclasts	>0.9999
Endothelial cells vs. Plasmocytes	0.7174
Myeloid cells 1 vs. Myeloid cells 2	0.9982
Myeloid cells 1 vs. NK/T cells	>0.9999
Myeloid cells 1 vs. Osteoblastic OS cells	<0.0001
Myeloid cells 1 vs. Osteoclasts	>0.9999
Myeloid cells 1 vs. Plasmocytes	0.3051
Myeloid cells 2 vs. NK/T cells	0.9862
Myeloid cells 2 vs. Osteoblastic OS cells	<0.0001
Myeloid cells 2 vs. Osteoclasts	0.9958
Myeloid cells 2 vs. Plasmocytes	0.7417
NK/T cells vs. Osteoblastic OS cells	<0.0001
NK/T cells vs. Osteoclasts	>0.9999
NK/T cells vs. Plasmocytes	0.2383
Osteoblastic OS cells vs. Osteoclasts	<0.0001
Osteoblastic OS cells vs. Plasmocytes	<0.0001
Osteoclasts vs. Plasmocytes	0.386

List of p values for pairwise comparisons of *COL13A1* expression levels between OS cell types.

***COL13A1* pairwise comparisons**	**P Value**
B cells vs. Carcinoma associated fibroblasts	<0.0001
B cells vs. Endothelial cells	<0.0001
B cells vs. Myeloid cells 1	>0.9999
B cells vs. Myeloid cells 2	>0.9999
B cells vs. NK/T cells	>0.9999
B cells vs. Osteoblastic OS cells	<0.0001
B cells vs. Osteoclasts	>0.9999
B cells vs. Plasmocytes	>0.9999
Carcinoma associated fibroblasts vs. Endothelial cells	0.9208
Carcinoma associated fibroblasts vs. Myeloid cells 1	<0.0001
Carcinoma associated fibroblasts vs. Myeloid cells 2	<0.0001
Carcinoma associated fibroblasts vs. NK/T cells	<0.0001
Carcinoma associated fibroblasts vs. Osteoblastic OS cells	<0.0001
Carcinoma associated fibroblasts vs. Osteoclasts	<0.0001
Carcinoma associated fibroblasts vs. Plasmocytes	<0.0001
Endothelial cells vs. Myeloid cells 1	<0.0001
Endothelial cells vs. Myeloid cells 2	<0.0001
Endothelial cells vs. NK/T cells	<0.0001
Endothelial cells vs. Osteoblastic OS cells	<0.0001
Endothelial cells vs. Osteoclasts	<0.0001
Endothelial cells vs. Plasmocytes	<0.0001
Myeloid cells 1 vs. Myeloid cells 2	>0.9999
Myeloid cells 1 vs. NK/T cells	>0.9999
Myeloid cells 1 vs. Osteoblastic OS cells	<0.0001
Myeloid cells 1 vs. Osteoclasts	0.9998
Myeloid cells 1 vs. Plasmocytes	>0.9999
Myeloid cells 2 vs. NK/T cells	>0.9999
Myeloid cells 2 vs. Osteoblastic OS cells	<0.0001
Myeloid cells 2 vs. Osteoclasts	>0.9999
Myeloid cells 2 vs. Plasmocytes	>0.9999
NK/T cells vs. Osteoblastic OS cells	<0.0001
NK/T cells vs. Osteoclasts	>0.9999
NK/T cells vs. Plasmocytes	>0.9999
Osteoblastic OS cells vs. Osteoclasts	<0.0001
Osteoblastic OS cells vs. Plasmocytes	<0.0001
Osteoclasts vs. Plasmocytes	>0.9999

List of p values for pairwise comparisons of *JAG2* expression levels between OS cell types.

***JAG2* pairwise comparisons**	**P Value**
B cells vs. Carcinoma associated fibroblasts	>0.9999
B cells vs. Endothelial cells	<0.0001
B cells vs. Myeloid cells 1	>0.9999
B cells vs. Myeloid cells 2	>0.9999
B cells vs. NK/T cells	0.9998
B cells vs. Osteoblastic OS cells	<0.0001
B cells vs. Osteoclasts	0.999
B cells vs. Plasmocytes	>0.9999
Carcinoma associated fibroblasts vs. Endothelial cells	<0.0001
Carcinoma associated fibroblasts vs. Myeloid cells 1	0.9997
Carcinoma associated fibroblasts vs. Myeloid cells 2	>0.9999
Carcinoma associated fibroblasts vs. NK/T cells	>0.9999
Carcinoma associated fibroblasts vs. Osteoblastic OS cells	<0.0001
Carcinoma associated fibroblasts vs. Osteoclasts	>0.9999
Carcinoma associated fibroblasts vs. Plasmocytes	>0.9999
Endothelial cells vs. Myeloid cells 1	<0.0001
Endothelial cells vs. Myeloid cells 2	<0.0001
Endothelial cells vs. NK/T cells	<0.0001
Endothelial cells vs. Osteoblastic OS cells	<0.0001
Endothelial cells vs. Osteoclasts	<0.0001
Endothelial cells vs. Plasmocytes	<0.0001
Myeloid cells 1 vs. Myeloid cells 2	>0.9999
Myeloid cells 1 vs. NK/T cells	0.985
Myeloid cells 1 vs. Osteoblastic OS cells	<0.0001
Myeloid cells 1 vs. Osteoclasts	0.9806
Myeloid cells 1 vs. Plasmocytes	>0.9999
Myeloid cells 2 vs. NK/T cells	>0.9999
Myeloid cells 2 vs. Osteoblastic OS cells	<0.0001
Myeloid cells 2 vs. Osteoclasts	0.999
Myeloid cells 2 vs. Plasmocytes	>0.9999
NK/T cells vs. Osteoblastic OS cells	<0.0001
NK/T cells vs. Osteoclasts	>0.9999
NK/T cells vs. Plasmocytes	>0.9999
Osteoblastic OS cells vs. Osteoclasts	<0.0001
Osteoblastic OS cells vs. Plasmocytes	<0.0001
Osteoclasts vs. Plasmocytes	0.9996

List of p values for pairwise comparisons of *KAZALD1* expression levels between OS cell types.

***KAZALD1* pairwise comparisons**	**P Value**
B cells vs. Carcinoma associated fibroblasts	<0.0001
B cells vs. Endothelial cells	>0.9999
B cells vs. Myeloid cells 1	>0.9999
B cells vs. Myeloid cells 2	>0.9999
B cells vs. NK/T cells	>0.9999
B cells vs. Osteoblastic OS cells	<0.0001
B cells vs. Osteoclasts	>0.9999
B cells vs. Plasmocytes	>0.9999
Carcinoma associated fibroblasts vs. Endothelial cells	<0.0001
Carcinoma associated fibroblasts vs. Myeloid cells 1	<0.0001
Carcinoma associated fibroblasts vs. Myeloid cells 2	<0.0001
Carcinoma associated fibroblasts vs. NK/T cells	<0.0001
Carcinoma associated fibroblasts vs. Osteoblastic OS cells	>0.9999
Carcinoma associated fibroblasts vs. Osteoclasts	<0.0001
Carcinoma associated fibroblasts vs. Plasmocytes	<0.0001
Endothelial cells vs. Myeloid cells 1	>0.9999
Endothelial cells vs. Myeloid cells 2	>0.9999
Endothelial cells vs. NK/T cells	>0.9999
Endothelial cells vs. Osteoblastic OS cells	<0.0001
Endothelial cells vs. Osteoclasts	>0.9999
Endothelial cells vs. Plasmocytes	>0.9999
Myeloid cells 1 vs. Myeloid cells 2	>0.9999
Myeloid cells 1 vs. NK/T cells	>0.9999
Myeloid cells 1 vs. Osteoblastic OS cells	<0.0001
Myeloid cells 1 vs. Osteoclasts	>0.9999
Myeloid cells 1 vs. Plasmocytes	>0.9999
Myeloid cells 2 vs. NK/T cells	>0.9999
Myeloid cells 2 vs. Osteoblastic OS cells	<0.0001
Myeloid cells 2 vs. Osteoclasts	>0.9999
Myeloid cells 2 vs. Plasmocytes	>0.9999
NK/T cells vs. Osteoblastic OS cells	<0.0001
NK/T cells vs. Osteoclasts	0.9998
NK/T cells vs. Plasmocytes	0.9993
Osteoblastic OS cells vs. Osteoclasts	<0.0001
Osteoblastic OS cells vs. Plasmocytes	<0.0001
Osteoclasts vs. Plasmocytes	>0.9999

List of p values for pairwise comparisons of *LSAMP* expression levels between OS cell types.

***LSAMP* pairwise comparisons**	**P Value**
B cells vs. Carcinoma associated fibroblasts	<0.0001
B cells vs. Endothelial cells	>0.9999
B cells vs. Myeloid cells 1	>0.9999
B cells vs. Myeloid cells 2	>0.9999
B cells vs. NK/T cells	>0.9999
B cells vs. Osteoblastic OS cells	<0.0001
B cells vs. Osteoclasts	>0.9999
B cells vs. Plasmocytes	>0.9999
Carcinoma associated fibroblasts vs. Endothelial cells	<0.0001
Carcinoma associated fibroblasts vs. Myeloid cells 1	<0.0001
Carcinoma associated fibroblasts vs. Myeloid cells 2	<0.0001
Carcinoma associated fibroblasts vs. NK/T cells	<0.0001
Carcinoma associated fibroblasts vs. Osteoblastic OS cells	<0.0001
Carcinoma associated fibroblasts vs. Osteoclasts	<0.0001
Carcinoma associated fibroblasts vs. Plasmocytes	<0.0001
Endothelial cells vs. Myeloid cells 1	>0.9999
Endothelial cells vs. Myeloid cells 2	>0.9999
Endothelial cells vs. NK/T cells	>0.9999
Endothelial cells vs. Osteoblastic OS cells	<0.0001
Endothelial cells vs. Osteoclasts	>0.9999
Endothelial cells vs. Plasmocytes	>0.9999
Myeloid cells 1 vs. Myeloid cells 2	>0.9999
Myeloid cells 1 vs. NK/T cells	>0.9999
Myeloid cells 1 vs. Osteoblastic OS cells	<0.0001
Myeloid cells 1 vs. Osteoclasts	>0.9999
Myeloid cells 1 vs. Plasmocytes	>0.9999
Myeloid cells 2 vs. NK/T cells	>0.9999
Myeloid cells 2 vs. Osteoblastic OS cells	<0.0001
Myeloid cells 2 vs. Osteoclasts	>0.9999
Myeloid cells 2 vs. Plasmocytes	>0.9999
NK/T cells vs. Osteoblastic OS cells	<0.0001
NK/T cells vs. Osteoclasts	>0.9999
NK/T cells vs. Plasmocytes	>0.9999
Osteoblastic OS cells vs. Osteoclasts	<0.0001
Osteoblastic OS cells vs. Plasmocytes	<0.0001
Osteoclasts vs. Plasmocytes	>0.9999