

A Single-Cell Transcriptome Atlas of the Human Pancreas

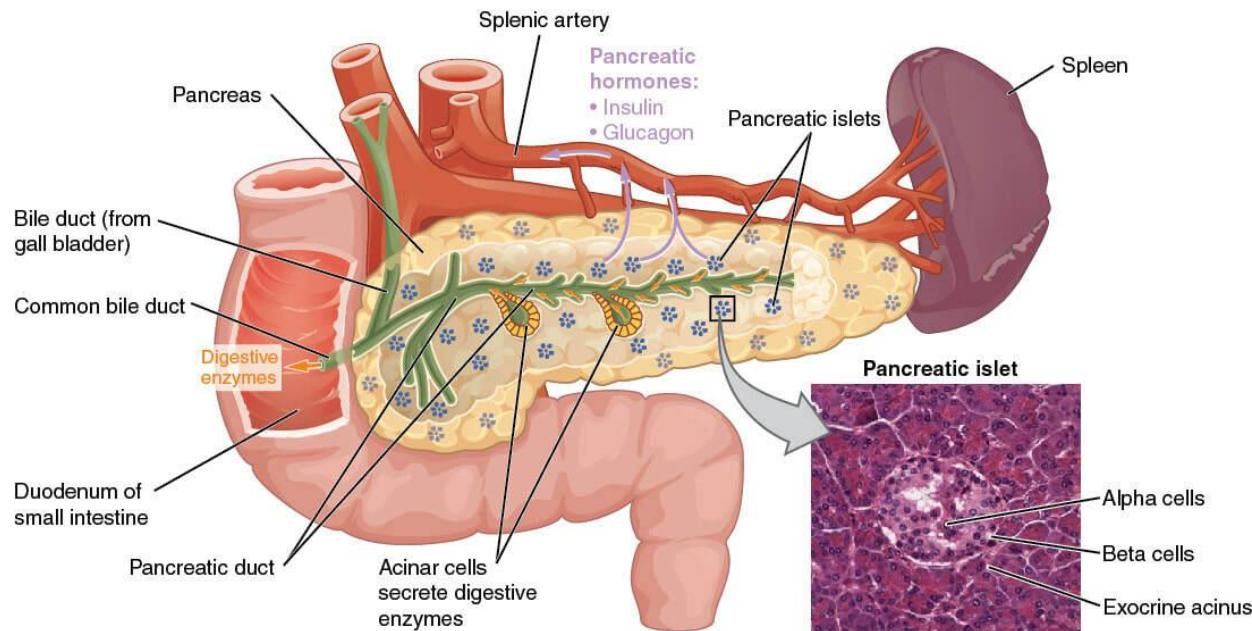
Replication and extension of GSE85241 data analysis

Muraro et al., 2016

DOI: [10.1016/j.cels.2016.09.002](https://doi.org/10.1016/j.cels.2016.09.002)

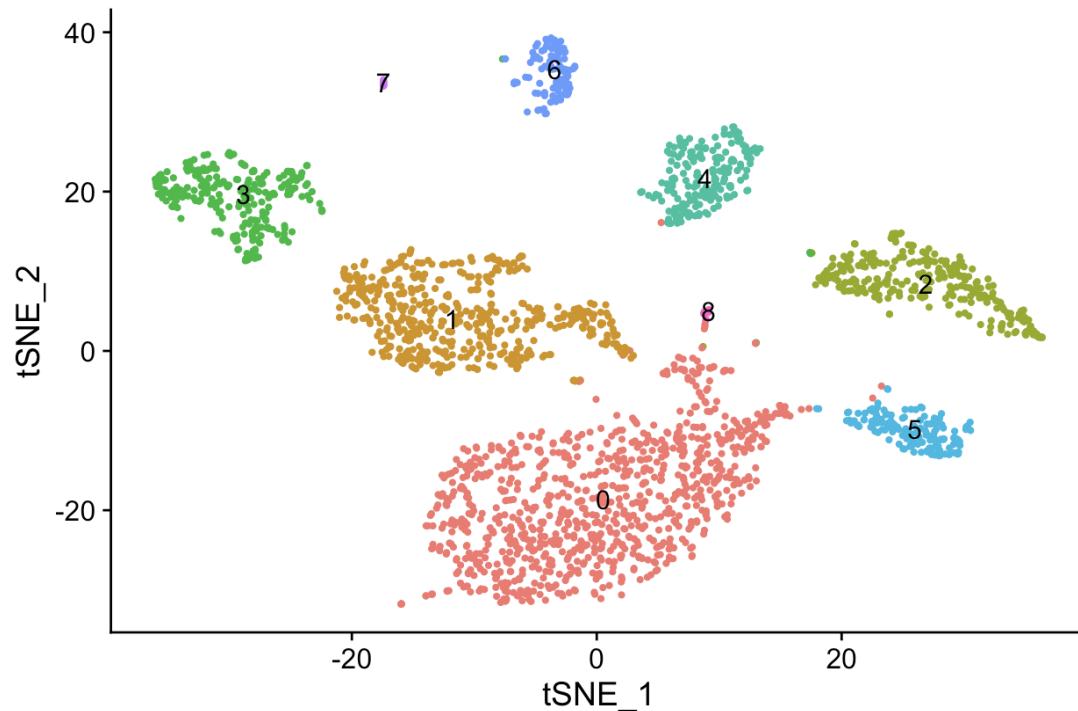
Julia Szkóp

Introduction

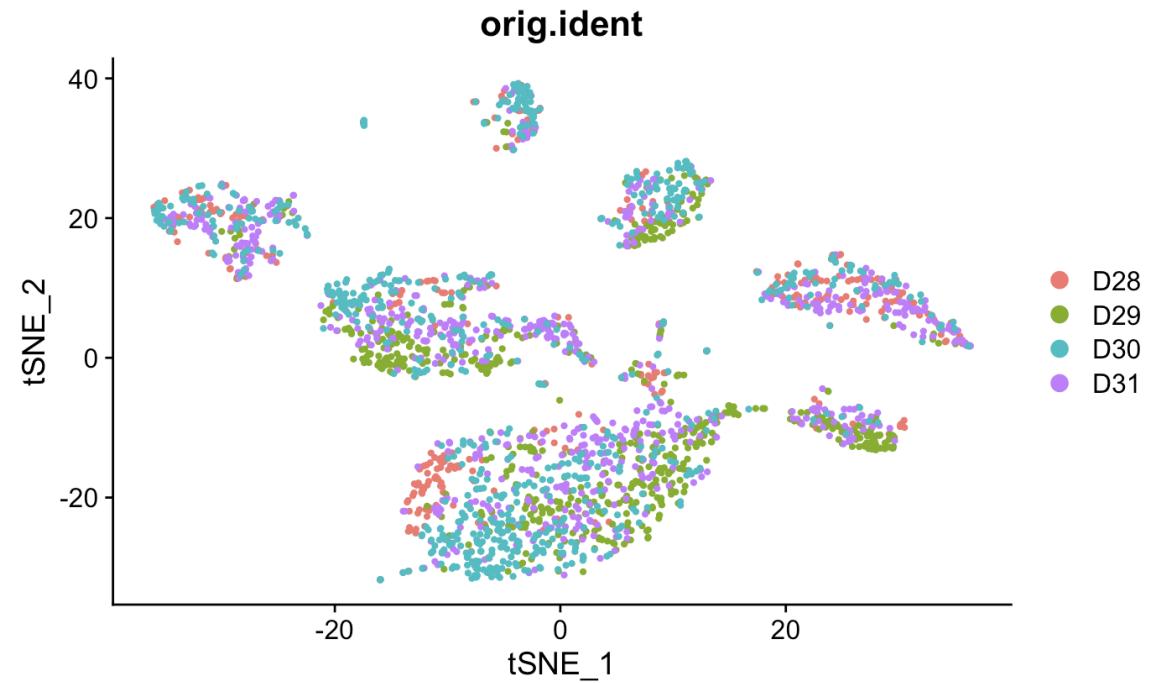


- **The pancreas** is a dual-function organ (exocrine: digestive enzymes; endocrine: hormone secretion) composed of multiple interdependent cell types; understanding its physiology and disease requires genome-wide data for each cell type.
- **Cellular heterogeneity** in the pancreas can only be resolved at single-cell resolution (single-cell RNA-seq), which uncovers even rare subpopulations.

t-SNE Clustering



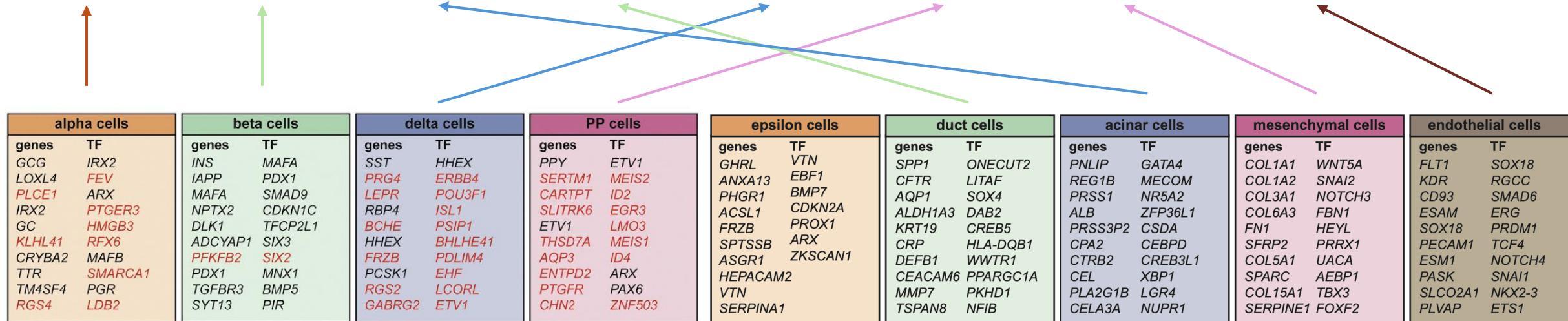
```
DimPlot(pancreas, reduction = "tsne", label = TRUE)
```



```
DimPlot(pancreas, reduction = "tsne", group.by = "orig.ident")
```

Identification of cell types

Cluster 0	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8
TMEM236	WSCD2	AMY2A	CEACAM7	GABRA1	PPY	POSTN	SELE	FPR3
PLCE1	HHATL	PRSS3P2	KRT23	NTNG1	NPFFR2	ITGA11	PLVAP	C1QA
LOXL4	DLK1	CPA2	FUT3	GHSR	SLITRK6	CDH11	NKX2-3	CCL3
PTPRT	INS	ALB	CEACAM6	PPFIA2	SERTM1	GLI2	ECSCR	C1QC
IRX2	MAFA	PNLIPRP2	APCDD1	SYT1	PTGFR	COL8A1	FCN3	LILRB2
KLHL41	LRRTM3	SERPINI2	SLC3A1	BCHE	GPC5-AS1	PTGIR	ROBO4	MS4A6A
DPP4	CAPN13	REG3G	VCAM1	FRZB	KCNG1	POM121L9P	SOX18	TREM2
CRYBA2	SIX3	PNLIP	SLC34A2	LRFN5	THSD7A	HSD11B1	KDR	RNASE6
SPOCK3	ADCYAP1	PRSS1	ALDH1A3	HAP1	PCDH10	PDGFRB	EMCN	OLR1
GCG	IAPP	CELA3A	NR1H4	CBLN4	CARD11	TBX2	ELTD1	MPEG1



No Epsilon cells?

Cluster 8

FPR3
C1QA
CCL3
C1QC
LILRB2
MS4A6A
TREM2
RNASE6
OLR1
MPEG1



THE HUMAN PROTEIN ATLAS

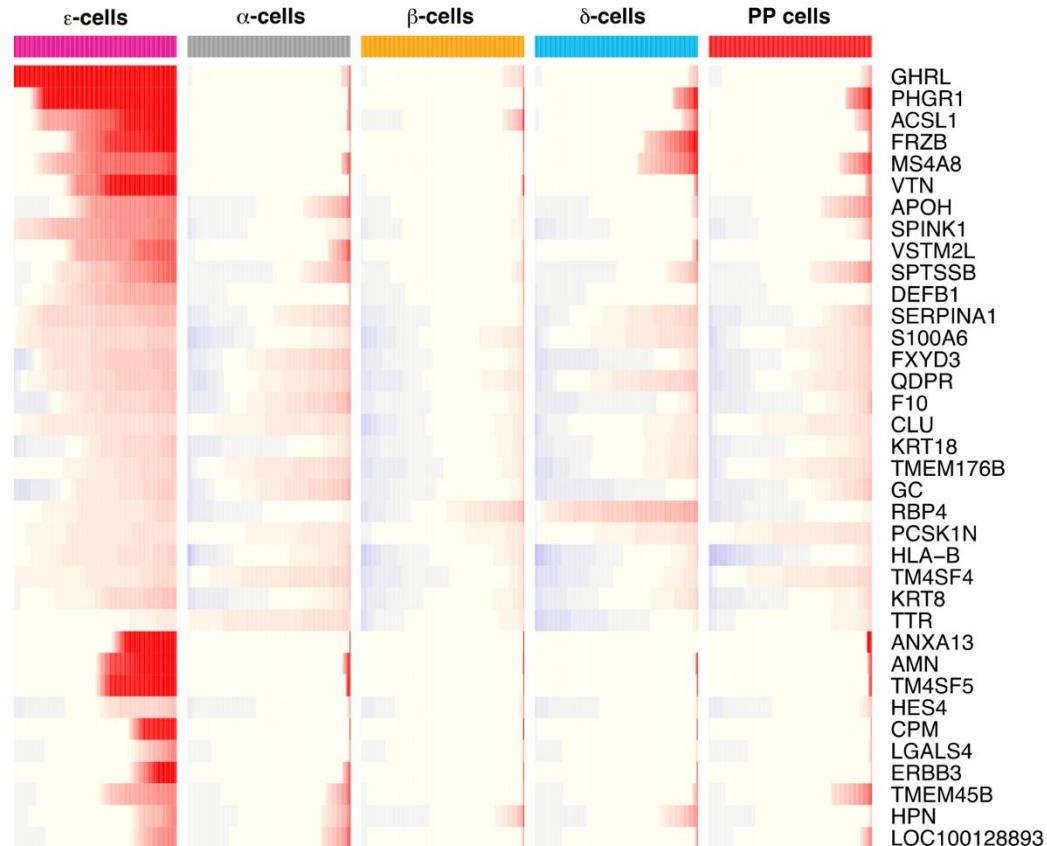
↓
Macrophages

Gene Signature of the Human Pancreatic ϵ Cell

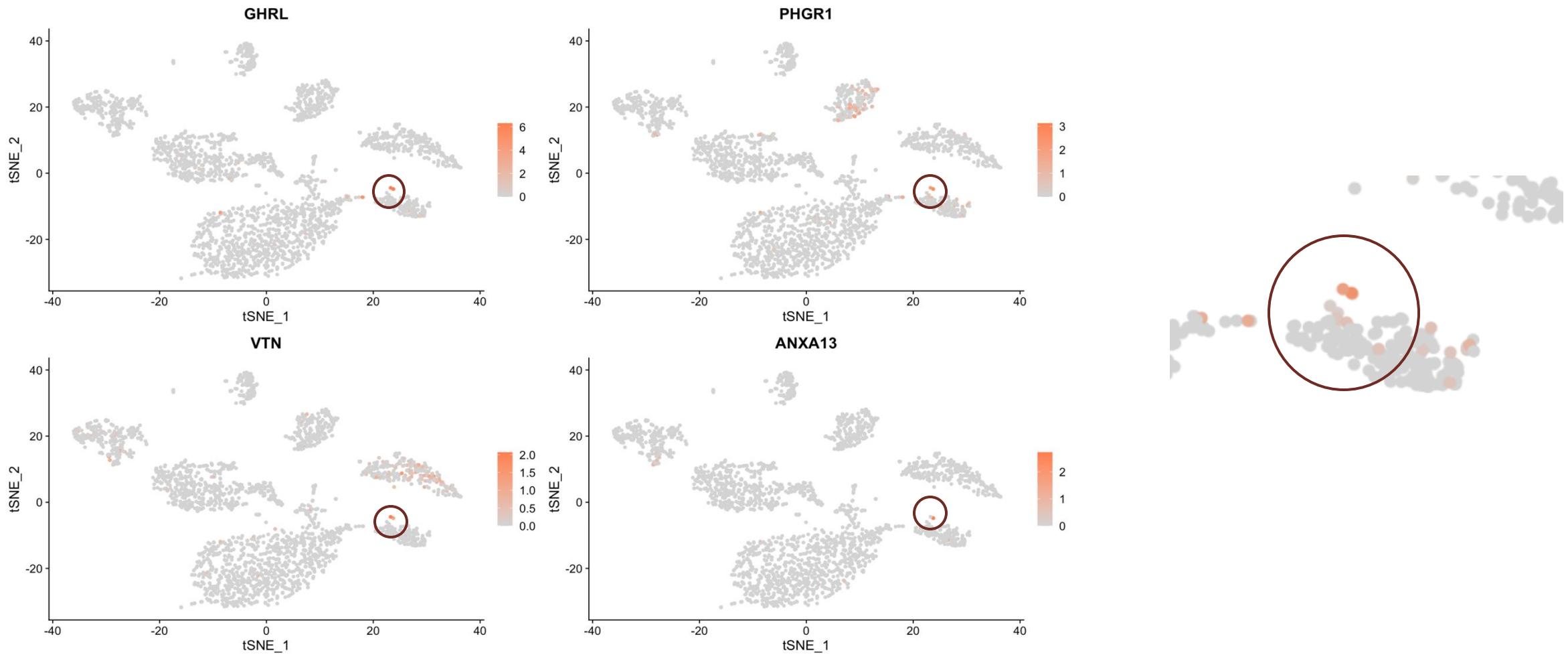
Giselle Dominguez Gutierrez , Jinrang Kim, Ann-Hwee Lee, Jenny Tong, JingJing Niu, Sarah M Gray, Yi Wei, Yueming Ding, Min Ni, Christina Adler ... Show more

Endocrinology, Volume 159, Issue 12, December 2018, Pages 4023–4032,
<https://doi.org/10.1210/en.2018-00833>

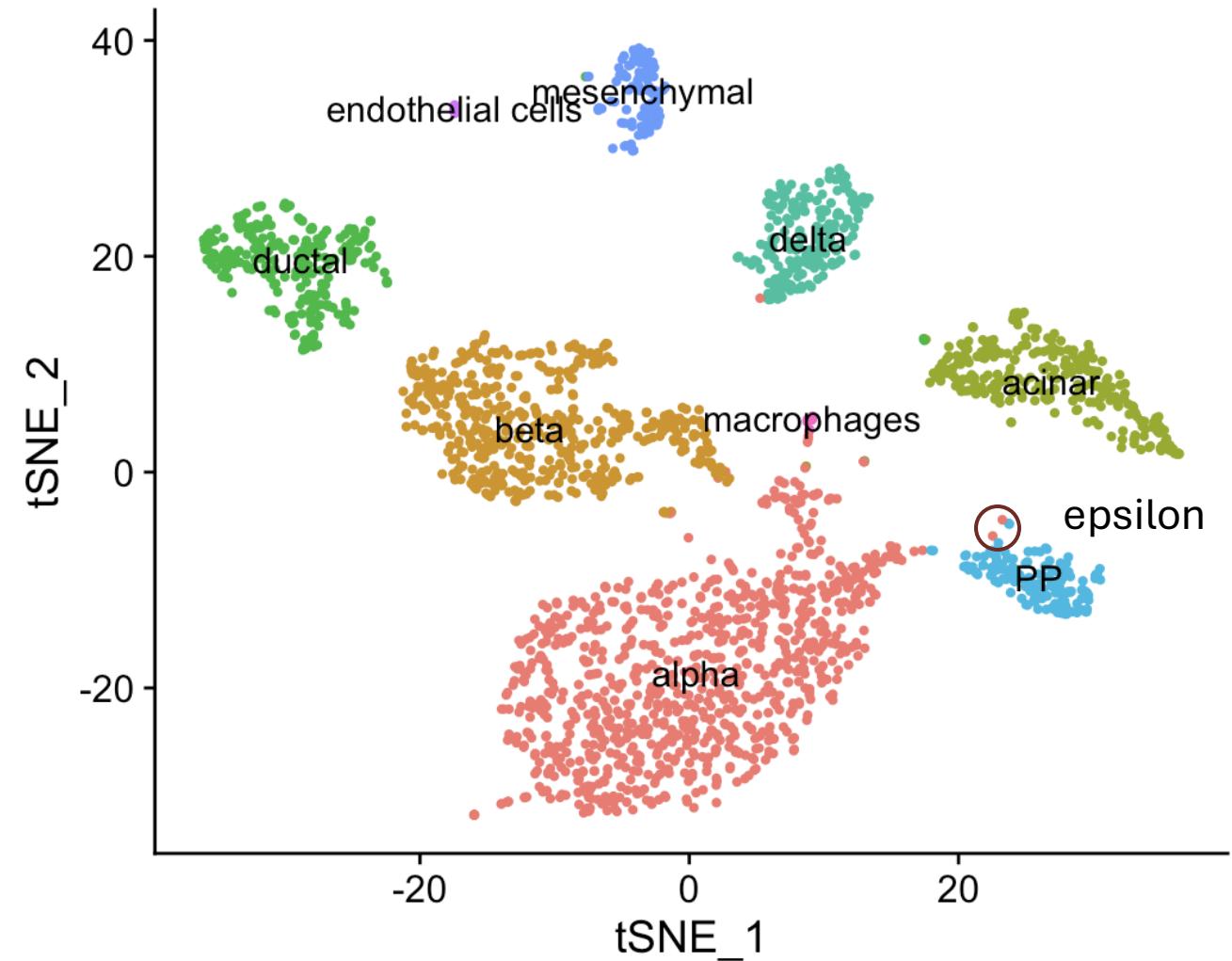
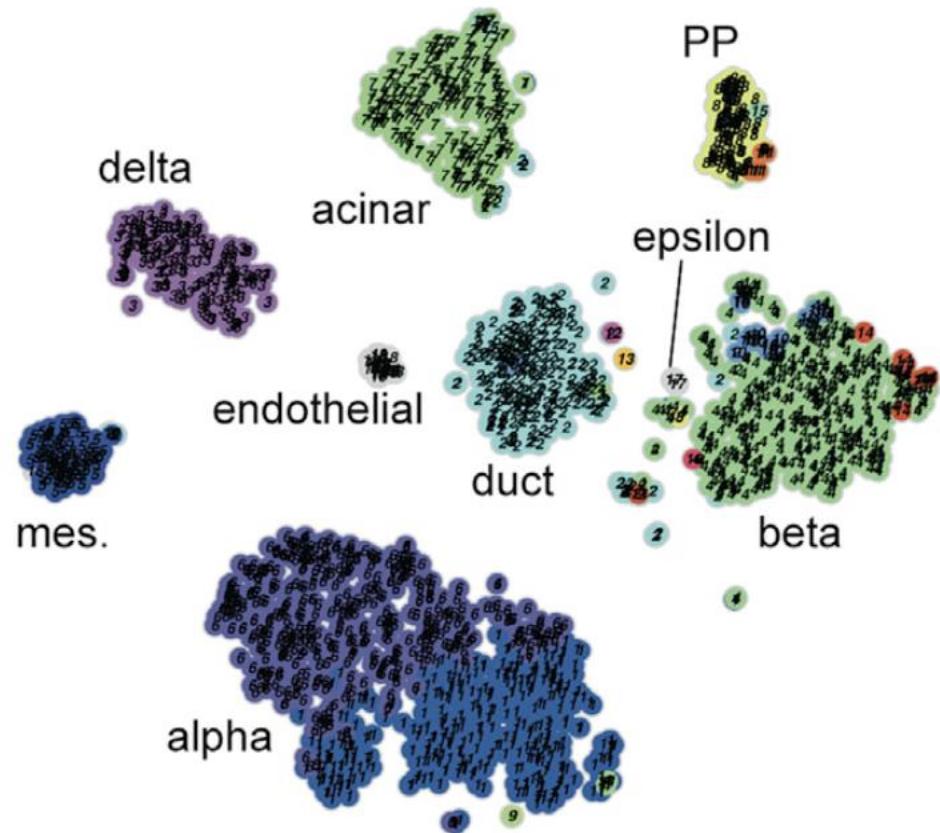
Published: 30 October 2018 Article history ▾



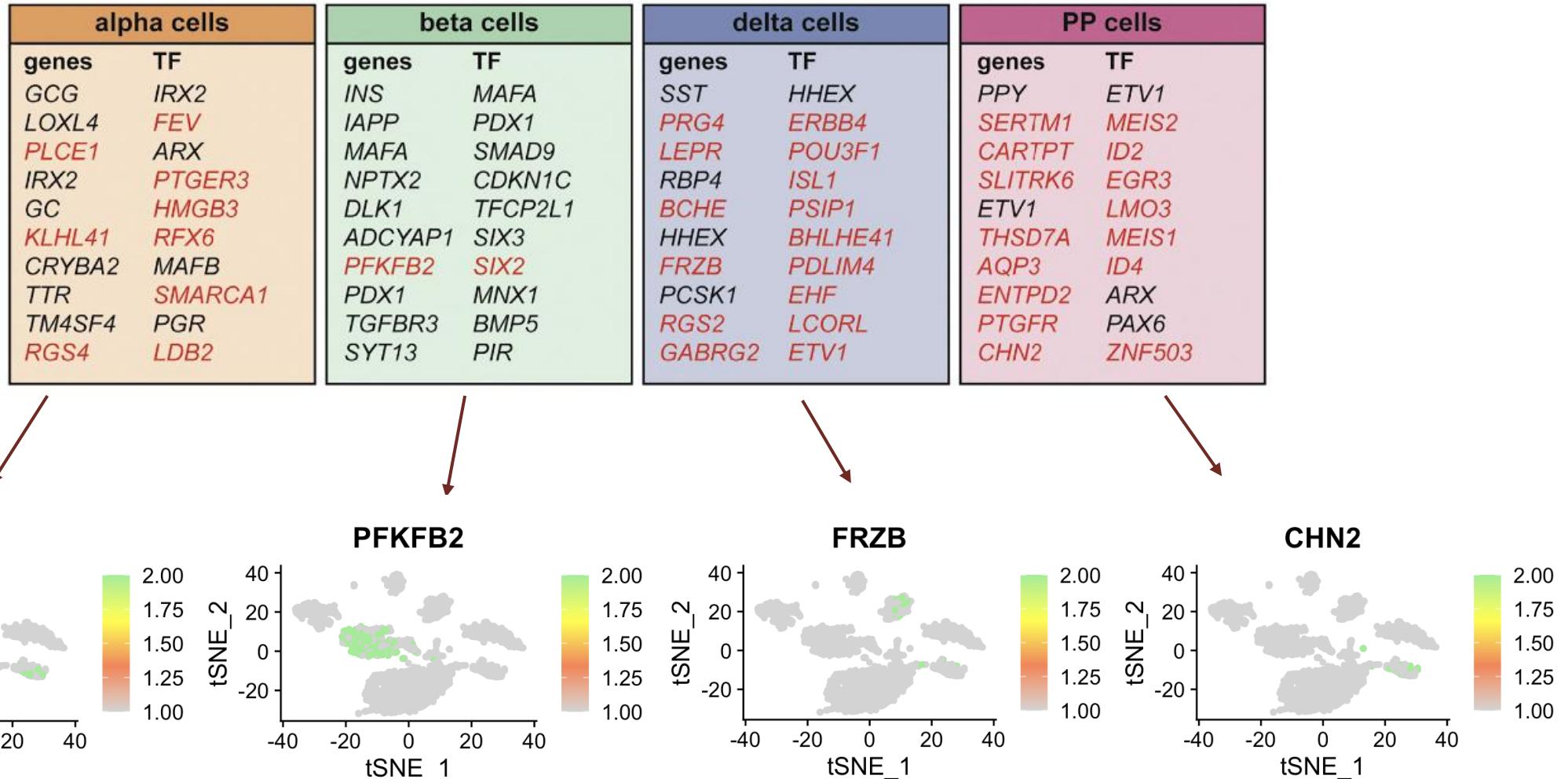
Investigation and evidence in ε -cell case



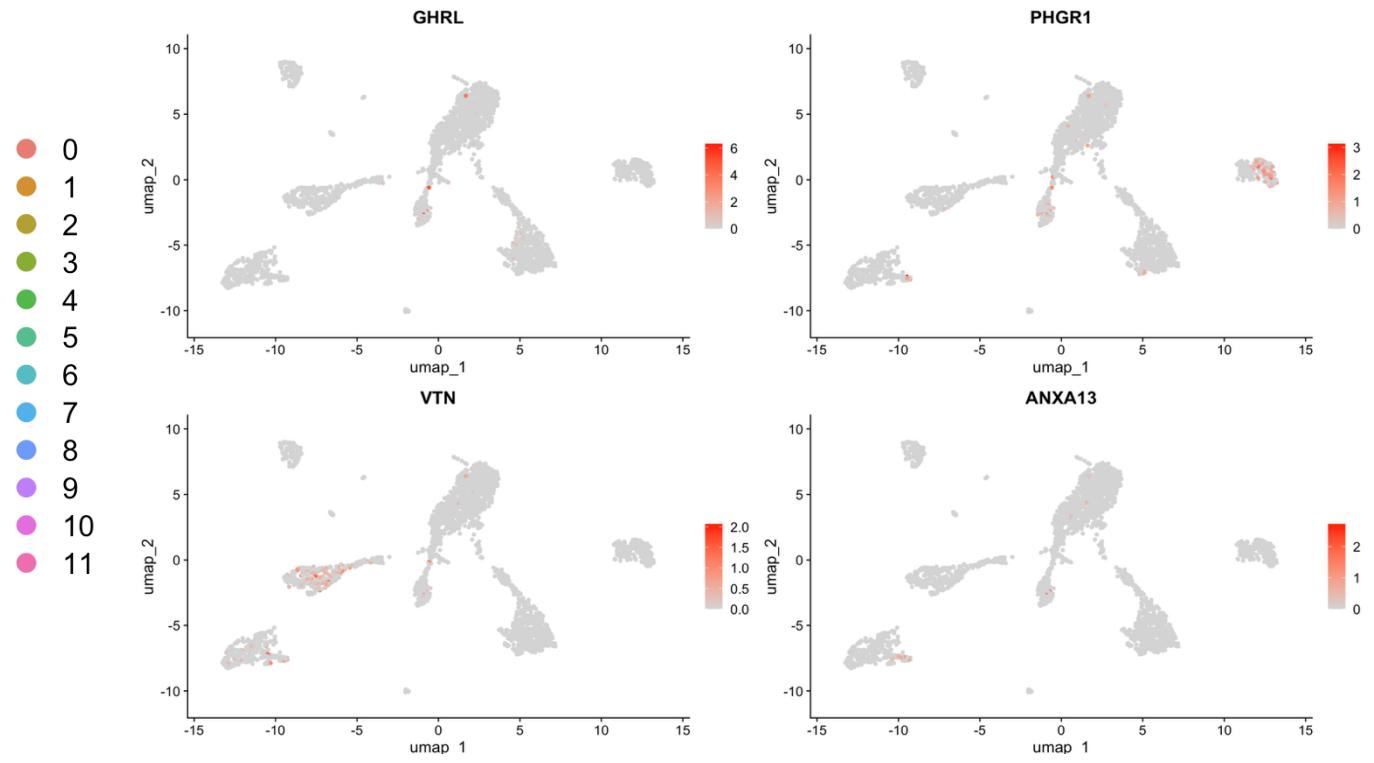
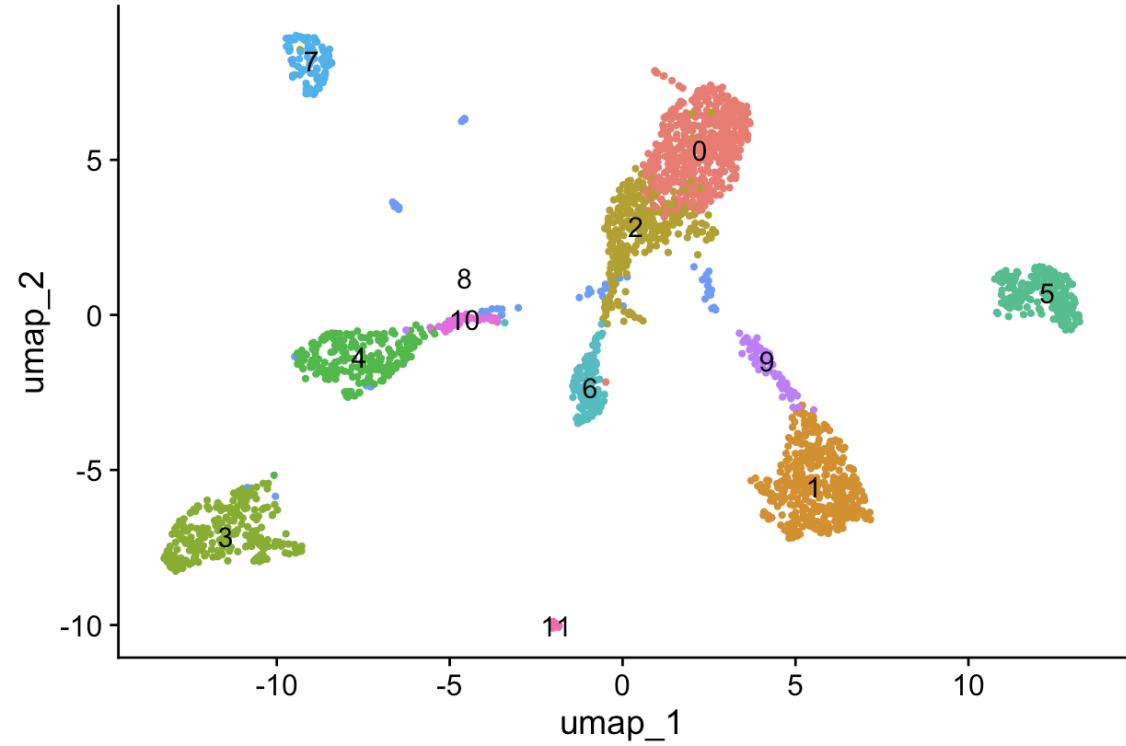
t-SNE Clustering Reveals Pancreatic Cell Types



Top 10 differentially expressed genes & TFs per cluster in publication



UMAP – finding ε -cells



Additional Public Pancreas scRNA-seq

Pancreatic Ppy-expressing γ -cells display mixed phenotypic traits and the adaptive plasticity to engage insulin production

[Marta Perez-Frances](#), [Léon van Gurp](#), [Maria Valentina Abate](#), [Valentina Cigliola](#), [Kenichiro Furuyama](#), [Eva Bru-Tari](#), [Daniel Oropeza](#), [Taïna Carreaux](#), [Yoshio Fujitani](#), [Fabrizio Thorel](#) & [Pedro L. Herrera](#) 

Nature Communications **12**, Article number: 4458 (2021) | [Cite this article](#)

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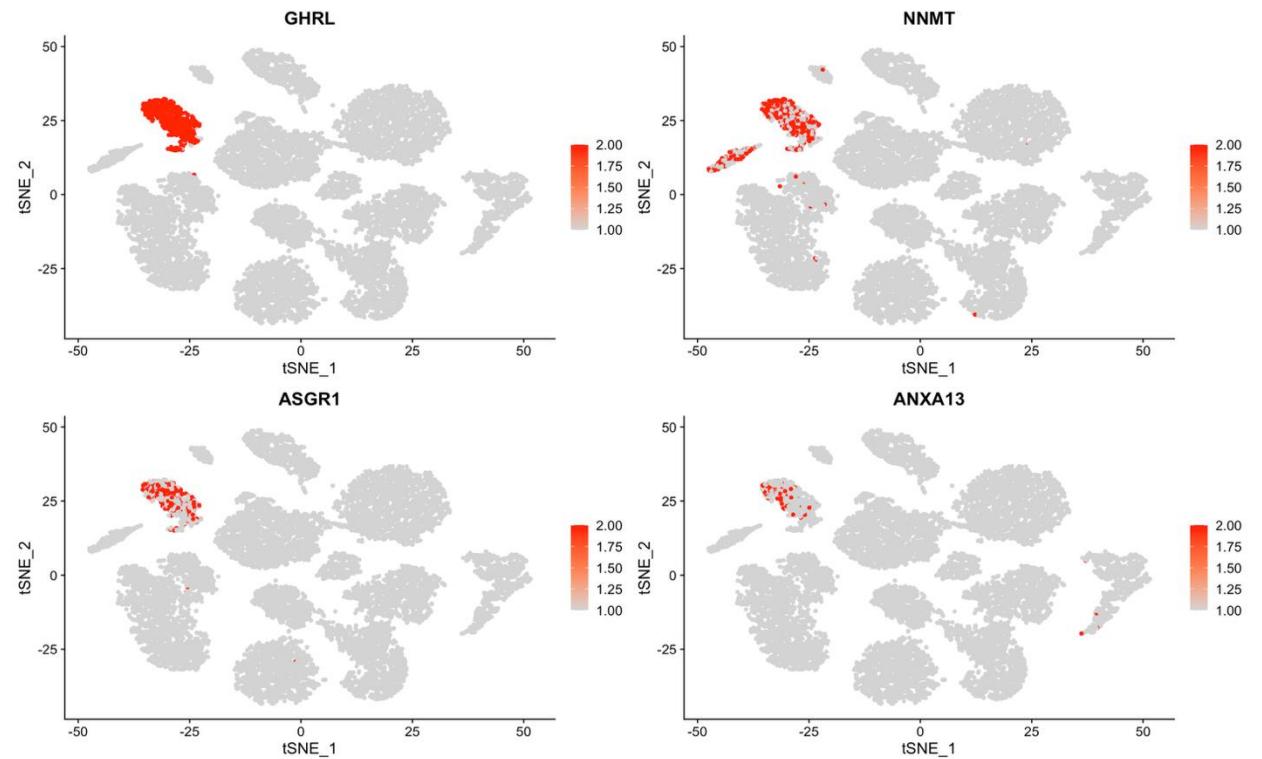
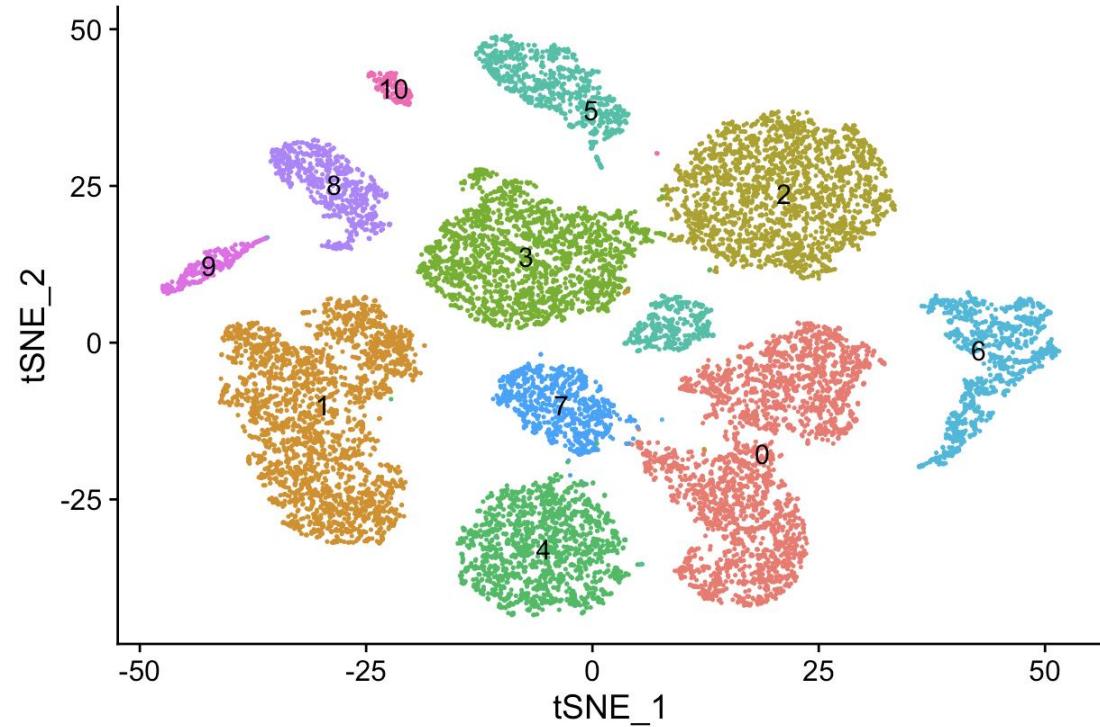
GSM4557280 Single cell RNA sequencing of human pancreatic islet cells
enriched for gamma and epsilon cells - donor 1

GSM4557281 Single cell RNA sequencing of human pancreatic islet cells
enriched for delta cells - donor 1

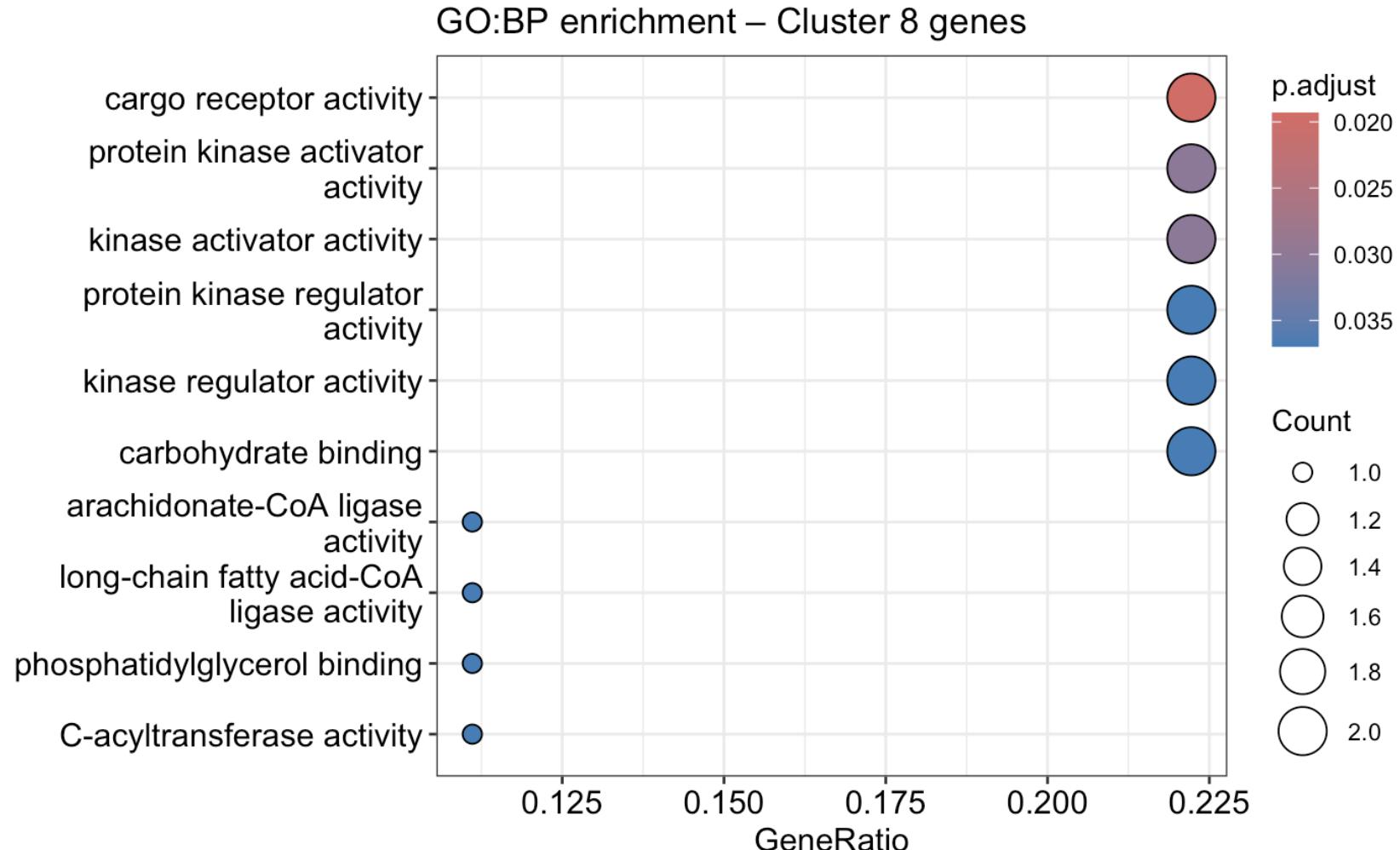
GSM4557282 Single cell RNA sequencing of human pancreatic islet cells
enriched for gamma and epsilon cells - donor 2

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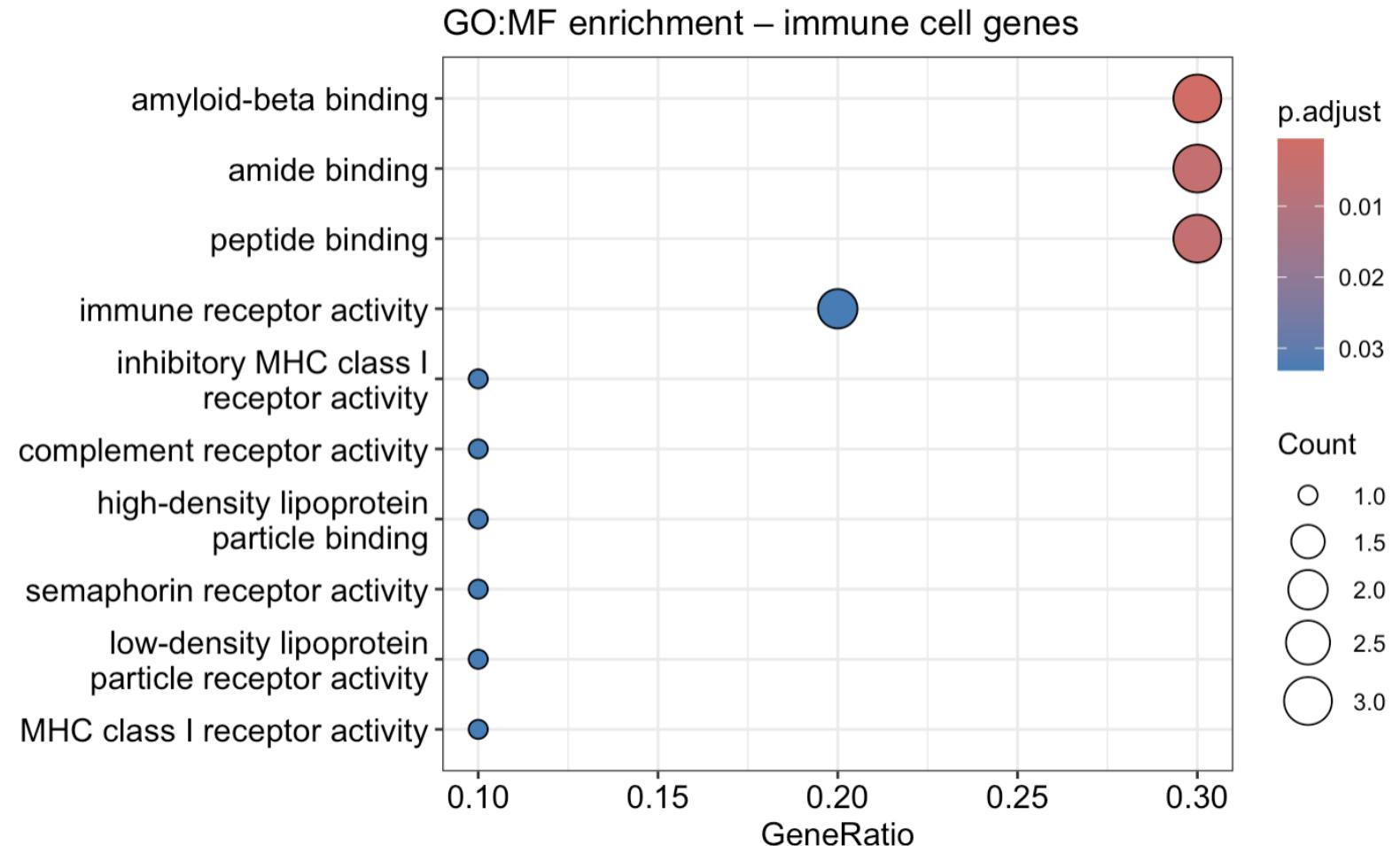
t-SNE Clustering



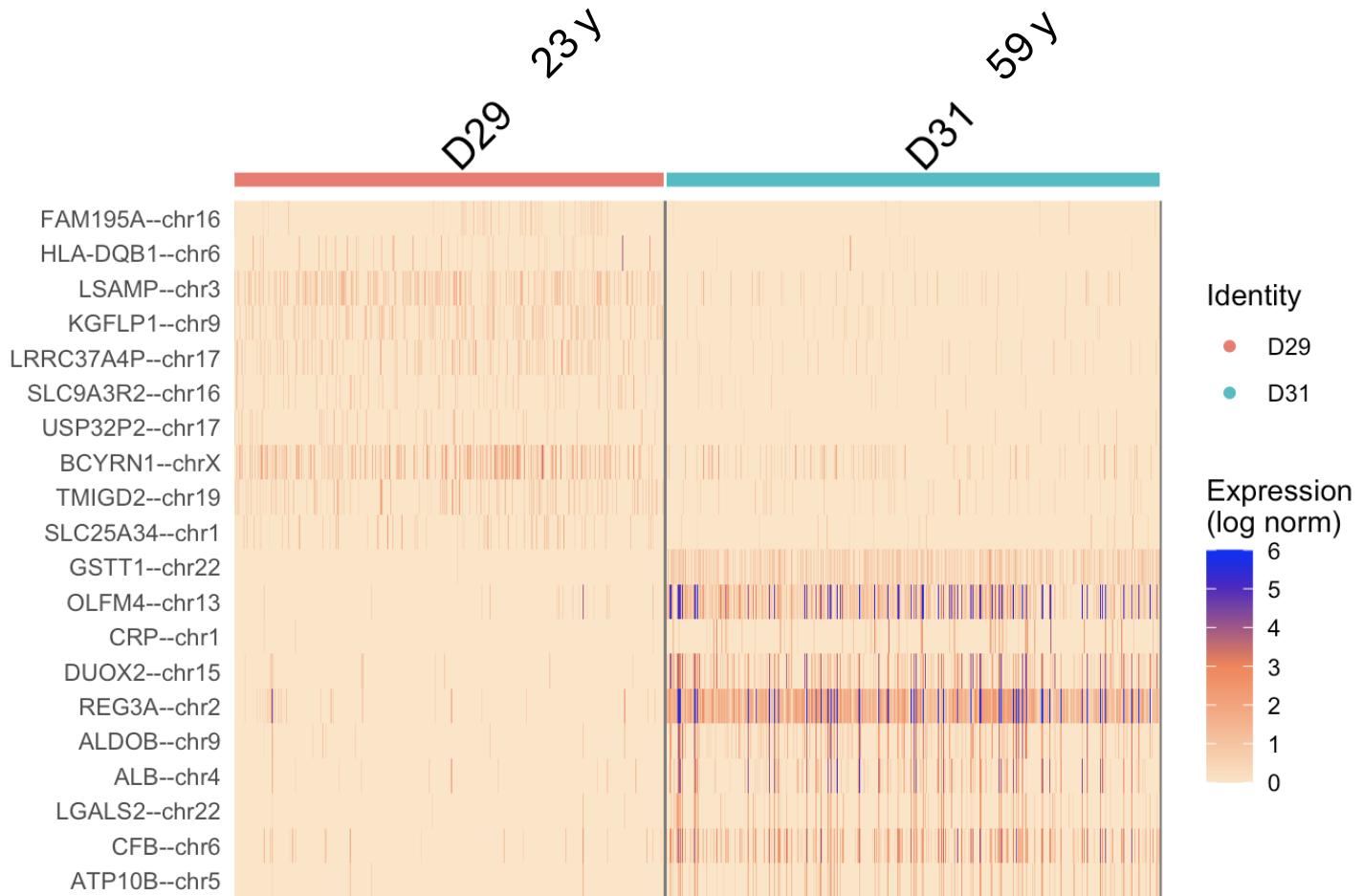
GO:MF enrichment for pancreatic ϵ -cell genes



GO:MF enrichment for pancreatic immune cells

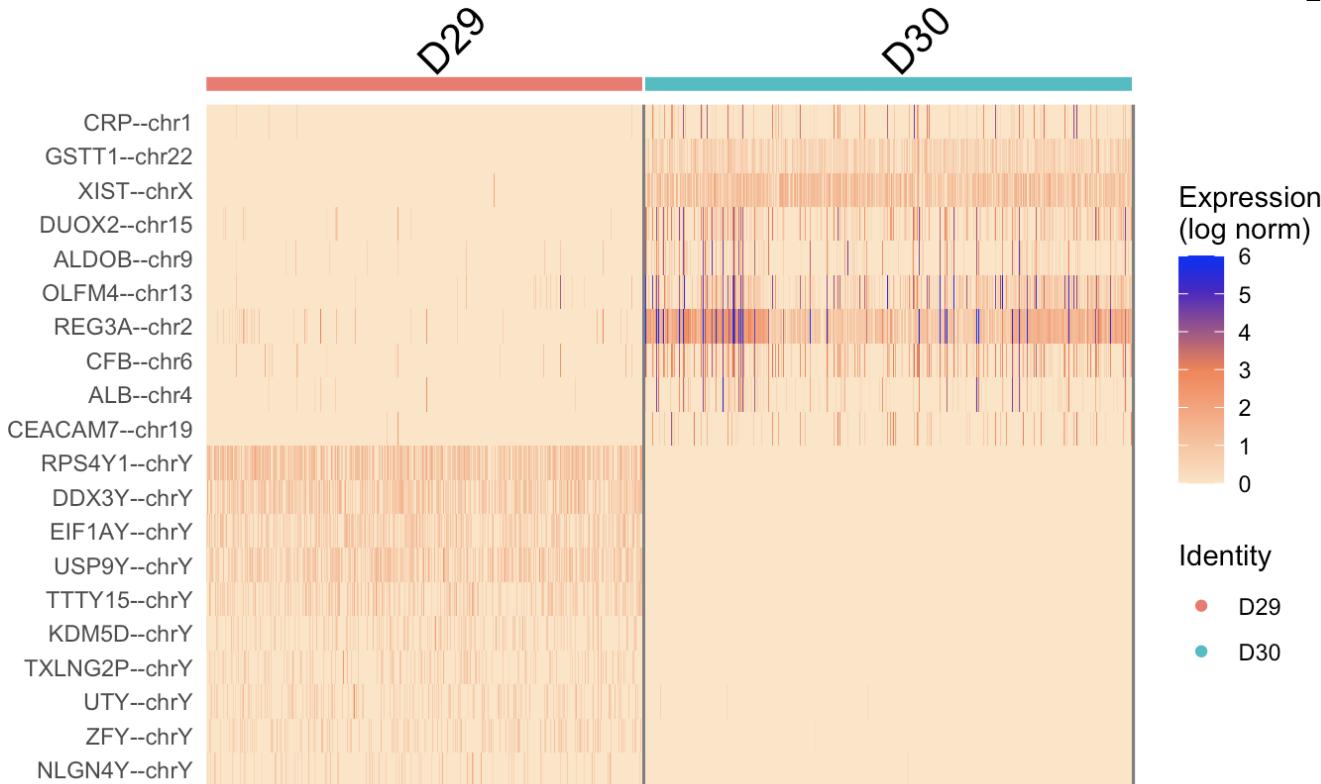


Donor-Level Differential Analyses



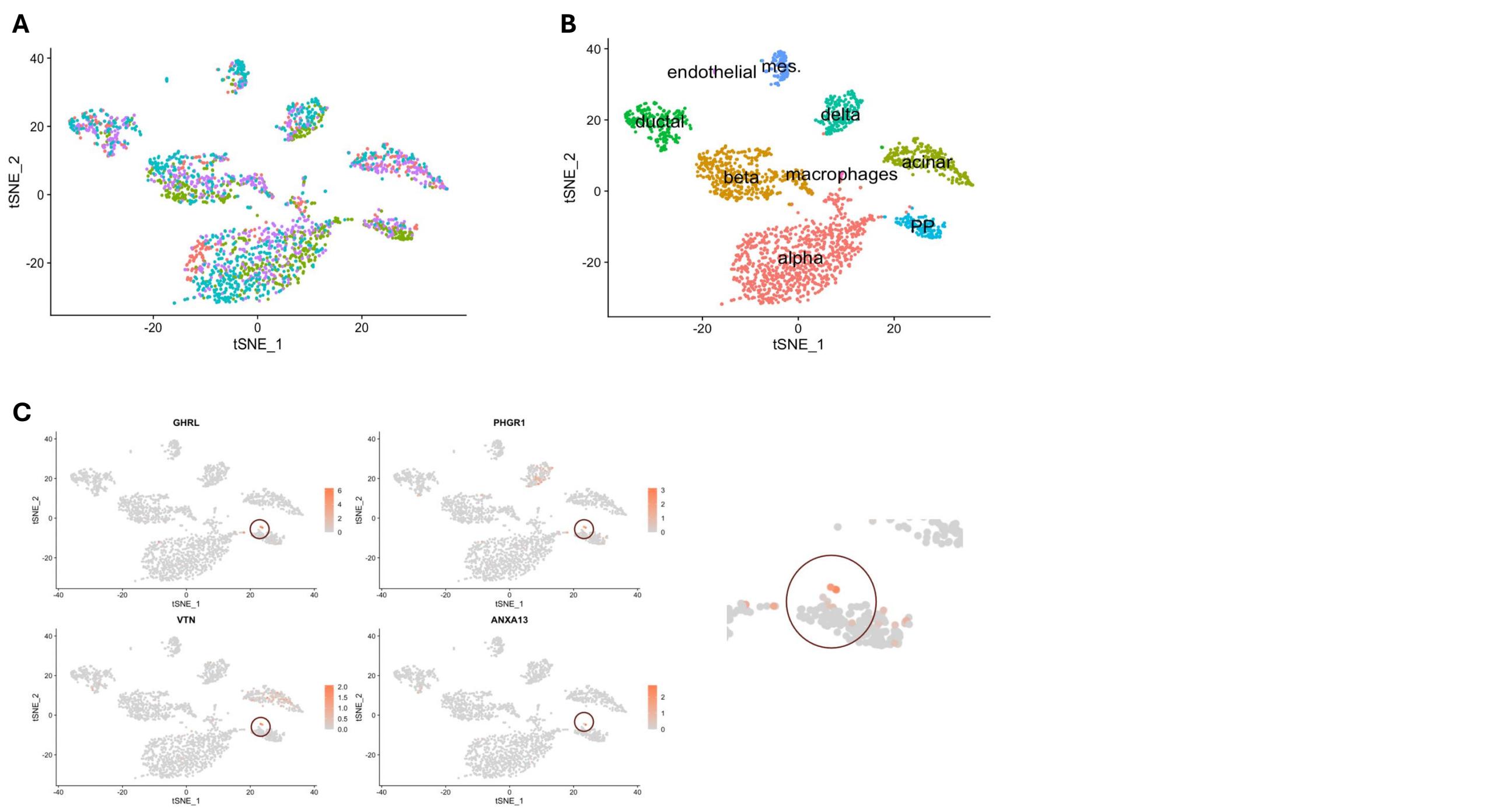
- 59 y: ↑ inflammatory /immune (CRP, CFB, LGALS2) and oxidative stress (DUOX2) genes; nearly absent at 23 y.
- OLFM4/REG3A (tissue-repair markers) silent at 23 y, highly expressed at 59 y.

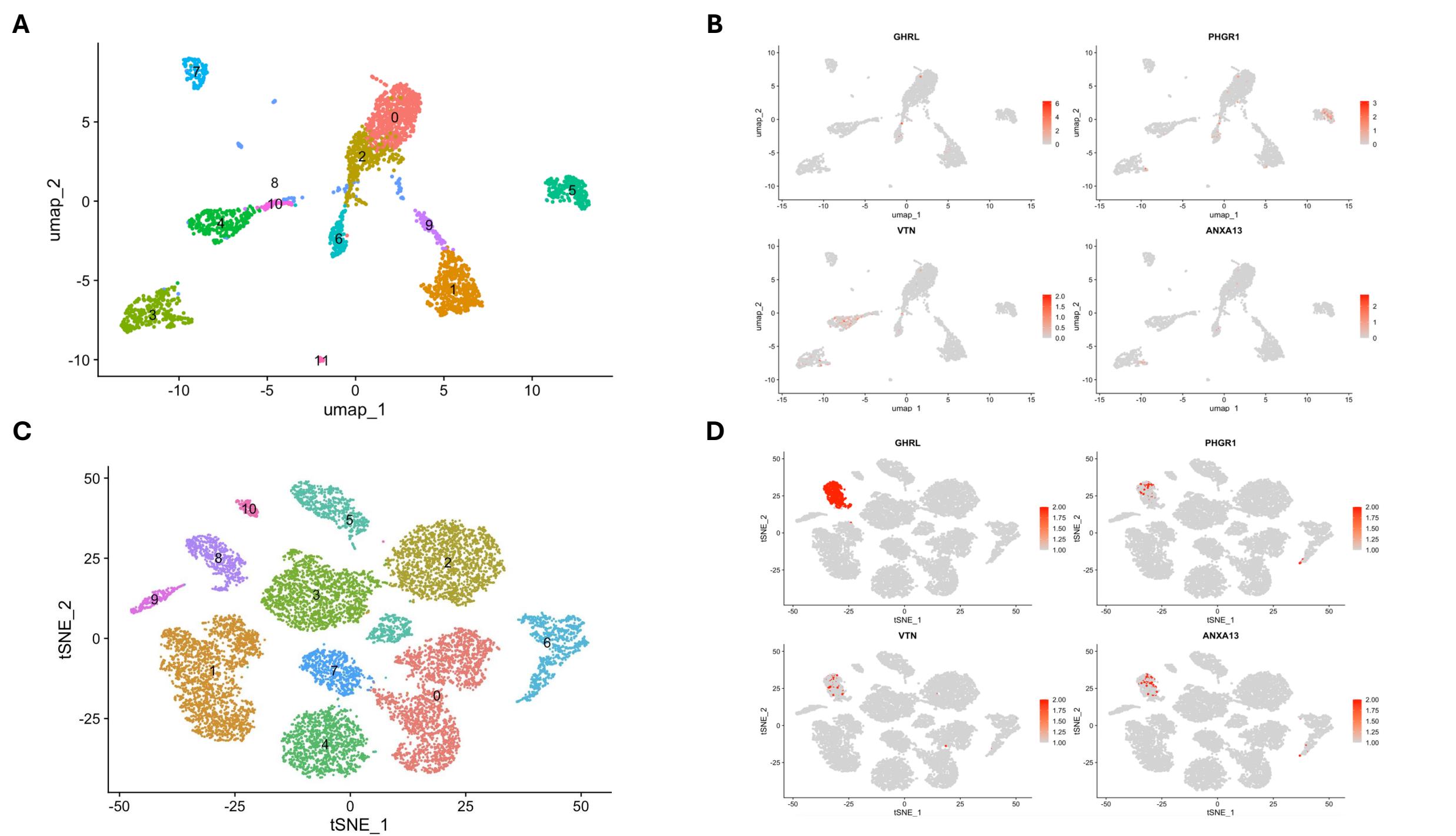
Donor-Level Differential Analyses

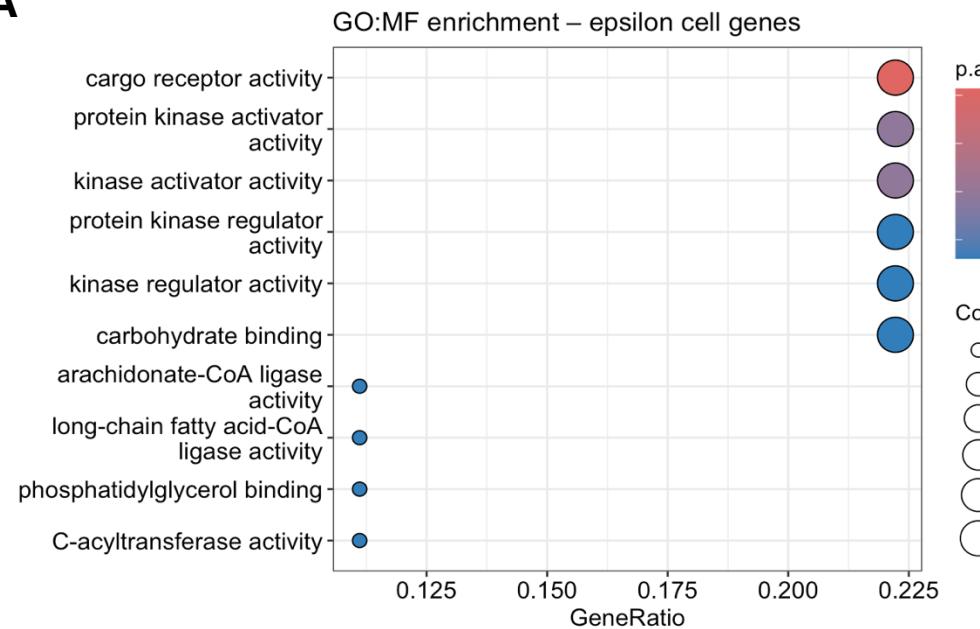
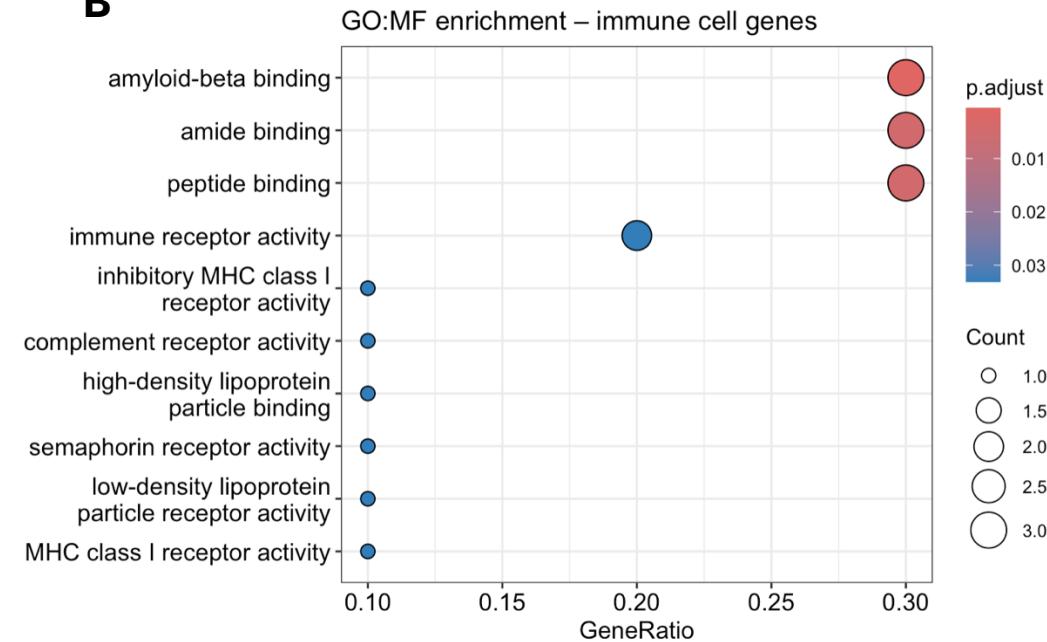
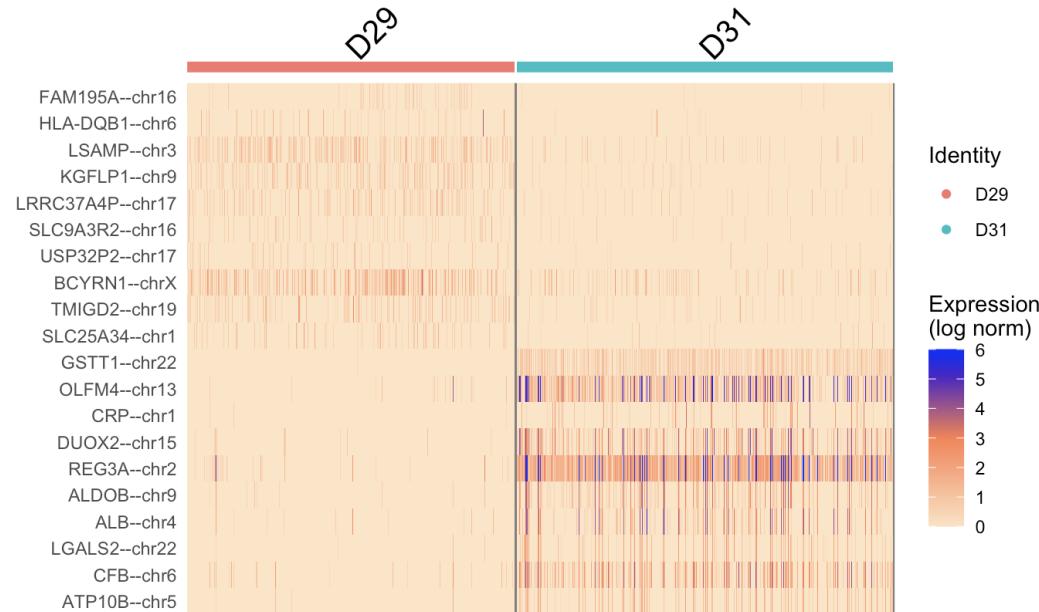


- D30 (male): strong Y-chromosome gene expression (e.g., RPS4Y1, DDX3Y, ZFY); absent in D29 (female).
- D29: high **XIST** expression (X-inactivation marker), absent in male sample.
- Inflammatory/stress genes (e.g., OLFM4, REG3A, CFB) more active in male (D30), silent in female (D29).

Thank you!





A**B****C****D**

