Interferon-γ induction of GBP5 in HeLa cells

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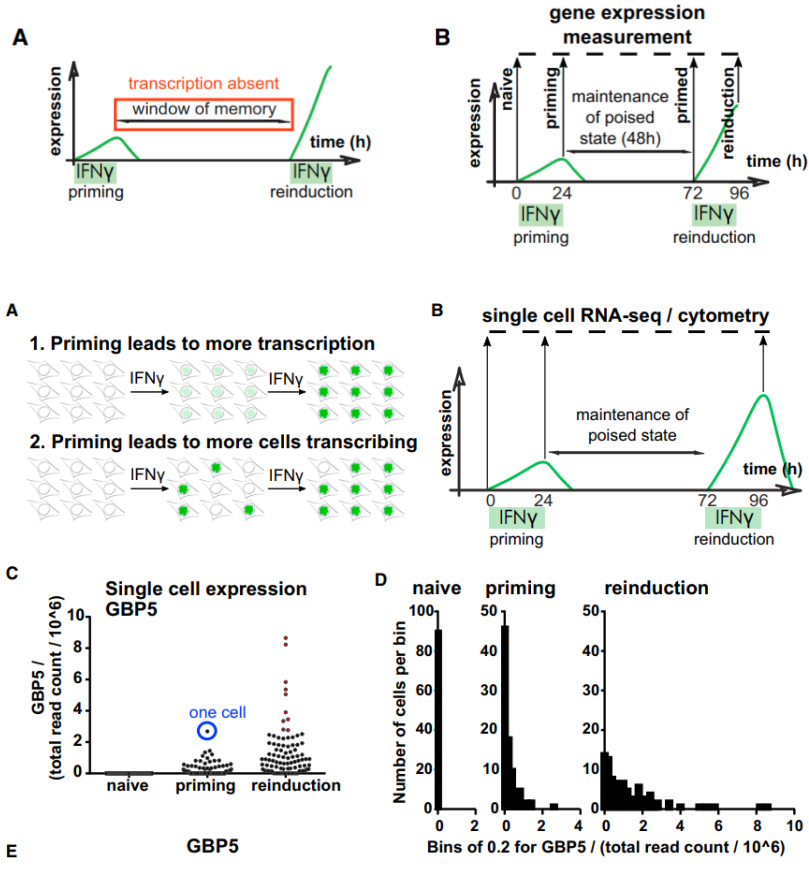
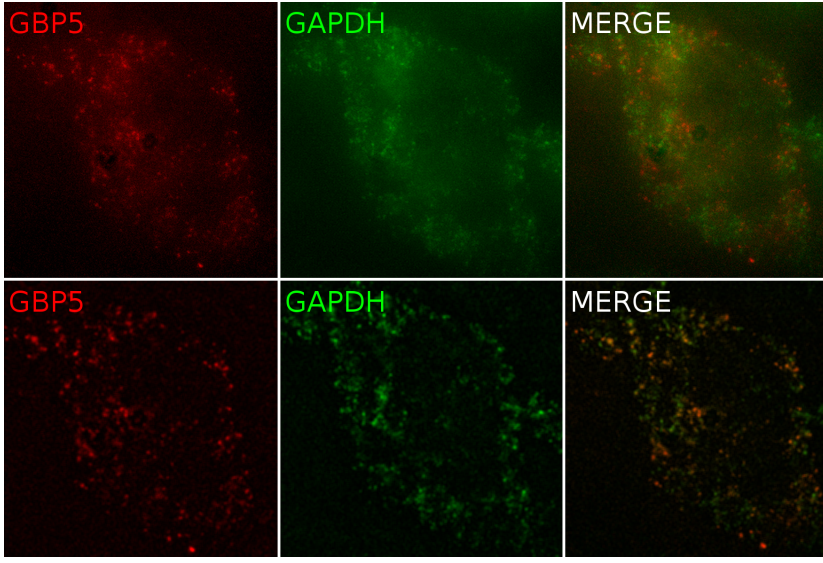
Single-cell RNA-seq identifies GBP5 as a memorized gene



Siwek et al. *Activation of Clustered IFNg Target Genes....*
Molecular Cell 2020

GBP5 expression @ 16h after IFN-γ exposure

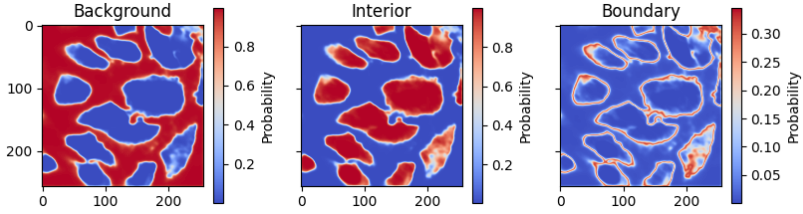
High-throughput 3D acquisition of DAPI + FISH probes for GAPDH, GBP5 mRNA in Hela cells on #1.5 chambered coverglass, 60x oil

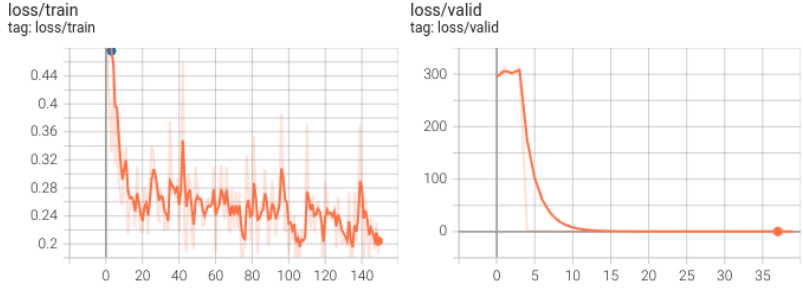


But as usual, segmentation is the rate-limiting step

Training a semantic segmentation with cross-entropy loss (log loss)

100 256 x 256 images (downsampled GAPDH channel), 80 train + 20 validation,

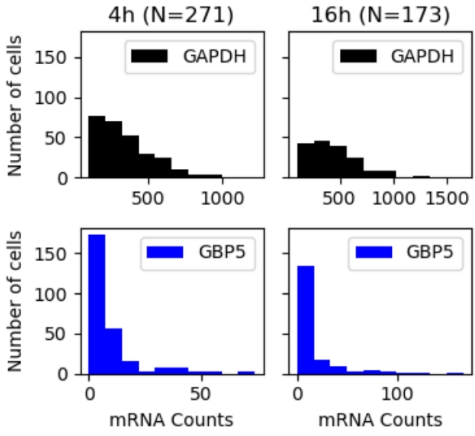


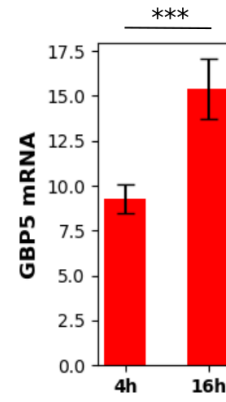


We train a 3-class semantic segmentation model with cross-entropy loss:

$$\mathcal{L} = \sum_{i,j} \log p_{ij}(\tilde{x}) = \sum_{i,j} \log \frac{\exp(-s_{ij}(\tilde{x}))}{\sum_{x \in \chi} \exp(-s_{ij}(\tilde{x}))}$$

p_{ij} is the probability the model assigns a pixel to the true class $\tilde{x} \in \{\mathrm{a}, \mathrm{b}, \mathrm{c}\}$


4h (N=271)
16h (N=173)
GAPDH
GAPDH
Number of cells
150
100
50
0
500
1000
500
1000
1500
GBP5
GBP5
Number of cells
150
100
50
0
0
50
0
100
mRNA Counts
mRNA Counts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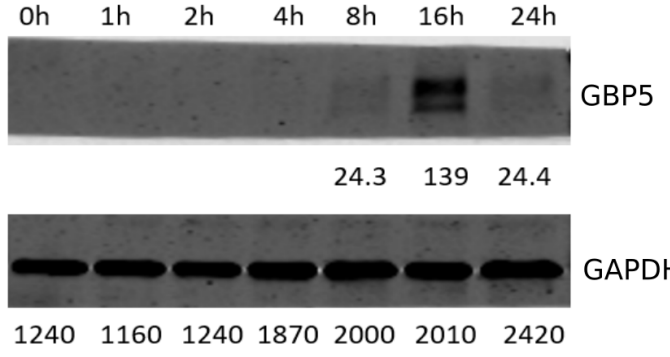
GBP5 mRNA
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
4h
16h


0h
1h
2h
4h
8h
16h
24h
GBP5
24.3
139
24.4
GAPDH
1240
1160
1240
1870
2000
2010
2420