

Extracting Biochemical Parameters from Protein Distributions of Vascular Cells

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Using quantitative data collected from adult rat aortic smooth muscle cell cultures *in vitro*, we analyze the various distributions of proteins which are synthesized during the formation of extracellular matrix, like collagen and tropoelastin. We compare these results to the theoretical 2-stage model developed in [1, 2] for protein synthesis, under the assumption that the time these proteins take to decay is significantly longer than their corresponding mRNA. As might be expected, we do not find any simple linear correlation between the cell proliferation and protein synthesis. However, using the theoretical model mentioned above, we are able to extract biochemical parameters that may not be easy to measure experimentally, such as the number of proteins translated during an mRNA lifetime.

References

- [1] Friedman N., Cai L., and Xie X. S. (2006). Linking Stochastic Dynamics to Population Distribution: An Analytical Framework of Gene Expression, *Physical Review Letters*, 97(16), 168302.
- [2] Shahrezaei V. and Swain P. S. (2008). Analytical distributions for stochastic gene expression, *Proceedings of the National Academy of Sciences*, 105(45), 17256–17261.