

Poster presentation

Open Access

A quantitative model for the GCN4 translational control in *Saccharomyces cerevisiae*

Tao You^{*1,2}, Alistair JP Brown¹ and George M Coghill²

Address: ¹Institute of Medical Science, University of Aberdeen, UK and ²Department of Computing Science, University of Aberdeen, UK

Email: Tao You* - t.you@abdn.ac.uk

* Corresponding author

from BioSysBio 2007: Systems Biology, Bioinformatics and Synthetic Biology
Manchester, UK. 11–13 January 2007

Published: 8 May 2007

BMC Systems Biology 2007, 1(Suppl 1):P1 doi:10.1186/1752-0509-1-S1-P1

This abstract is available from: <http://www.biomedcentral.com/1752-0509/1?issue=S1>

© 2007 You et al; licensee BioMed Central Ltd.

Cells are capable of accommodating the environmental changes by reprogramming gene expression. In the yeast *Saccharomyces cerevisiae*, under the amino acid deprivation condition, the translational barrier primarily exerted on GCN4 mRNA is alleviated to enhance the production of Gcn4p, which subsequently induces the expression of nearly all genes involved in amino acid biosyntheses. Our Systems Biology project's goal is to construct a dynamic mathematical model that accurately predicts the kinetic behaviour of the GCN Response in *S. cerevisiae*. Here, we report the mathematical formulations to describe the translational control exerted on the GCN4 mRNA. More importantly, the kinetic parameter estimation for this model indicates differential scanning rates of the 40S ribosomal subunit on the GCN4 mRNA 5' leader sequence under the amino acid replete and starvation conditions. This discovery is speculated to be attributable to the change in relative helicase activities under the two conditions.

References

1. Hinnebusch AG: **Translational regulation of GCN4 and the general amino acid control of yeast.** *Annu Rev Microbiol* 2005, **59**:407-50. doi:10.1146/annurev.micro.59.031805.133833 pmid:16153175.
2. Grant CM, Miller PF, Hinnebusch AG: **Requirements for inter-cistronic distance and level of eukaryotic initiation factor 2 activity in reinitiation on GCN4 mRNA vary with the downstream cistron.** *Mol Cell Biol* 1994, **14**(4):2616-28. pmid:8139562.
3. Gillespie DT: **Exact stochastic simulation of coupled chemical reactions.** *J Phys Chem* 1977, **81**(25):2340-2361.
4. Berthelot K, Muldoon M, Rajkowsch L, Hughes J, McCarthy JE: **Dynamics and processivity of 40S ribosome scanning on mRNA in yeast.** *Mol Microbiol* 2004, **51**(4):987-1001. pmid:14763975.

5. Runarsson TP, Yao X: **Stochastic Ranking for Constrained Evolutionary Optimization.** *IEEE Transactions on Evolutionary Computation* 2000, **4**(3):284-294.