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GENE REGULATION

Noise versus plasticity

COMSTOCK

The variation in the expression level of a gene in response to stimuli (gene expression 'plasticity') often correlates with the variability in the expression level of that gene among cells under the same conditions (gene expression 'noise'). But are plasticity and noise intrinsically linked? This study in *Saccharomyces cerevisiae* shows that noise–plasticity coupling is restricted to genes with certain genomic and functional features.

By analysing published global quantitative date from *S. cerevisiae*, Lehner found that noise–plasticity coupling was much stronger for genes with TATA box elements in their promoters than for those without. Furthermore, he found that coupling was more frequent in genes with high proximal promoter nucleosome occupancy and high rates of histone exchange. These observations suggest that noise–plasticity coupling is influenced by promoter architecture and chromatin dynamics during transcription initiation.

It has previously been observed that genes that are essential for viability tend to have low noise — too much variability in essential processes would be detrimental. Consistent with this, Lehner found that essential genes show little noise–plasticity coupling, even though these genes often require plasticity. The essential genes tend not to have the promoter features that are associated with coupling; such features might be selected against when coupling is detrimental.

Lehner also found that genes with duplicates are more likely to use TATA promoters and to have both high noise and high plasticity. Therefore duplication might be a way to escape the potential conflict between the disadvantages of noise and the benefits of plasticity, because functional compensation between duplicates reduces the consequences of noise.

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ORIGINAL RESEARCH PAPER
Lehner, B. Conflict between noise and plasticity in yeast. *PLoS Genet.* **6**, e1001185 (2010)