

Gene-environment interaction in yeast gene expression

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The nature vs. nurture debate is familiar to most people, and modern conclusions usually predict a balance between the two. A new paper published this week in the open-access journal *PLoS Biology* shows that there is a similar balance between the genes we inherit nature and the environment nurture in determining thousands of traits in yeast.

As we approach the age of personal genomics, in which each of us knows something about the genetic variations we carry, it is important to understand how genes and the environment interact in order to draw medically sound conclusions from the information available e.g. whether exercise can reduce risks that are increased because of a genetic predisposition towards a certain illness.

The phenomenon of gene/environment interaction has been documented before, that the environment affects the ways it genes are expressed so that genes that are on in one condition may be downregulated or switched off in other environments. What the new research, by Leonid Kruglyak and Erin Smith, of Princeton University, adds is the ability to study thousands of gene expression patterns simultaneously, to understand the general properties of these previously poorly understood interactions.

In this research, the individuals are yeast one from the lab and one from the vineyard, which differed genetically and the environment varied between two energy sources: glucose and ethanol. The experiment, then, is to measure how the genetic and the environmental differences interact to alter the gene expression of the yeast cells.

The expression of many genes is under the control of other genes. This paper shows that the environment often has a bigger effect on these regulated genes than on ones that are switched on and off by other, more direct mechanisms. Intriguingly, sometimes a control gene that

positively affects another gene in one environment may have the opposite effect in another environment.

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