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Genome-wide analysis of translation state: the effects of eukaryotic translation initiation factor 4E level

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Eukaryotic translation initiation factor 4E (eIF-4E) is believed to have an important role in controlling the rate of translation initiation. It does so by binding to the mRNA 5' cap, and bringing the mRNA into the protein synthesis initiation complex. When eIF4E is overexpressed, it can oncogenically transform cultured cells, whereas downregulation of eIF4E can lead to arrest in the G1 phase of the cell cycle. In this study, we used a high-throughput expression screen method, combining polysome display with high-density DNA array, to explore the effects of eIF4E level on both transcription and translation of individual mRNA species in the yeast *Saccharomyces cerevisiae*. The high-density DNA arrays consist of PCR products of all 6,000 ORFs of the entire yeast genome on glass slides. We find that eIF4E level preferentially affects synthesis of only a small proportion of proteins. This result is consistent with the view that eIF4E not only has a role in regulating general protein synthesis, but also preferentially affects the synthesis of a subset of proteins with regulatory functions.