1. **GCN4** is a transcriptional activator of amino acid biosynthetic genes in Saccharomyces cerevisiae whose expression is regulated by amino-acid availability at the translational level. No causal pair
2. **@GCD1$** and **@GCD2$** are negative regulators required for the repression of **GCN4** translation under nonstarvation conditions that is mediated by upstream open reading frames (uORFs) in the leader of **GCN4** mRNA. Casual Relation
3. **GCD** factors are thought to be antagonized by the positive regulators **GCN1, GCN2** and **@GCN3$** in amino acid-starved cells to allow for increased **GCN4** protein synthesis. Casual Relation
4. Previous genetic studies suggested that **@GCD1$@GCD2$**and **@GCN3$**have closely related functions in the regulation of **GCN4** expression that involve translation initiation factor 2 (eIF-2).Casual Relation
5. In agreement with these predictions, we show that **@GCD1$@GCD2$** and **@GCN3$** are integral components of a high-molecular-weight complex of approximately 600,000 Da. Casual Evidence
6. The three proteins copurified through several biochemical fractionation steps and could be coimmunoprecipitated by using antibodies against **@GCD1$** or **@GCD2$** No causal pair
7. Interestingly, a portion of the eIF-2 present in cell extracts also cofractionated and coimmunoprecipitated with these regulatory proteins but was dissociated from the **GCD1/GCD2/GCN3** complex by 0.5 M KCl. No causal pair
8. Incubation of a temperature-sensitive **gcdl-101** mutant at the restrictive temperature led to a rapid reduction in the average size and quantity of polysomes, plus an accumulation of inactive 80S ribosomal couples; in addition, excess amounts of eIF-2 alpha, **@GCD1$ @GCD2$** and **@GCN3$** were found comigrating with free 40S ribosomal subunits. Casual Relation
9. These results suggest that**@GCD1$** is required for an essential function involving eIF-2 at a late step in the translation initiation cycle. No causal pair
10. We propose that lowering the function of this high-molecular-weight complex, or of eIF-2 itself, in amino acid-starved cells leads to reduced ribosomal recognition of the uORFs and increased translation initiation at the **GCN4**start codon. No causal pair
11. Our results provide new insights into how general initiation factors can be regulated to affect gene-specific translational control.No causal pair

RELATION PAIRS: [['GCD1', 'GCD2', 'Low'], ['GCD1', 'GCN3', 'Low']]