Global gene expression programs in the response of yeast cells to low temperatures

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Wines produced at low temperatures (10-15°C) are known to develop certain suitable characteristics of taste and aroma. However, optimal growth temperature for *Saccharomyces cerevisiae* is 28°C, while 13°Cis a restrictive temperature, which increases the risk of stuck or sluggish fermentations. In addition, low temperature increases the duration of fermentation, decreases the rate growth, and modify the micro organism-ecology of fermenting wine. The adaptation of *S. cerevisiae* at low temperature involves a change in its gene expression profile. This study was undertaken to analyze the genome-wide response of yeast to low temperature in order to identify key genes required for low-temperature growth. It was possible to identify a large set of genes (156) that are induced at least 2-fold when cells are transferred from 30 to 13°C. Previous studies have focused on the role of several cold-shock-induced genes, such as *TIP1*, *TIR1*, *TIR2*, *NSR1*, *BFR2*, *CCTa*, and *CCTb*. Although some studies in yeast gene expression at low temperatures have been done, the global mechanism in response to low temperatures is still unclear. Here we discussed the putative role of the ammonia transporters *ATO3*, *MEP1*, *MEP2*, and *MEP3* during yeast growth at low temperature.