

# An All-or-None Response in Osmolyte-Dependent Gene Expression in *Saccharomyces cerevisiae*

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How cells sense their environment using signal transduction pathways and respond to this information by regulating gene expression is a key problem in systems biology. Here we investigate the coupling between signal transduction and gene expression in budding yeast. We monitor the activation of the osmo-sensitive kinase Hog1 and its resulting gene expression in single yeast cells. Performing single cell time-lapse experiments, we find that, although all cells show a similar activation dynamics of Hog1, downstream gene expression of *STL1* displays an all-or-none response. We observe that a fraction of cells show no gene expression at all, where other cells show gene expression over a wide range of expression levels. This fraction is dependent on the intensity of the osmo-shock.