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BIOSYSTEMS

SYNTHETIC BIOLOGY

Speed up Your Cell Line Development

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EXECUTIVE SUMMARY

Current strategies for optimizing gene expression during bioproduction rely heavily on trial-and-error, slowing down the development of efficient cell lines. Our light-controlled system offers a flexible and fast method to explore a wide range of expression levels before committing to stable engineering, streamlining the path toward high-yield, high-quality production.

PROBLEM

Optimization of bioproduction yield and quality as well as composition, in the case of multi-component products often requires challenging adaptability to balance expression of genes. This is of particular importance when optimizing new (complex) product production and in dependence on the chosen production cell line.

DATA ON THE SOLUTION

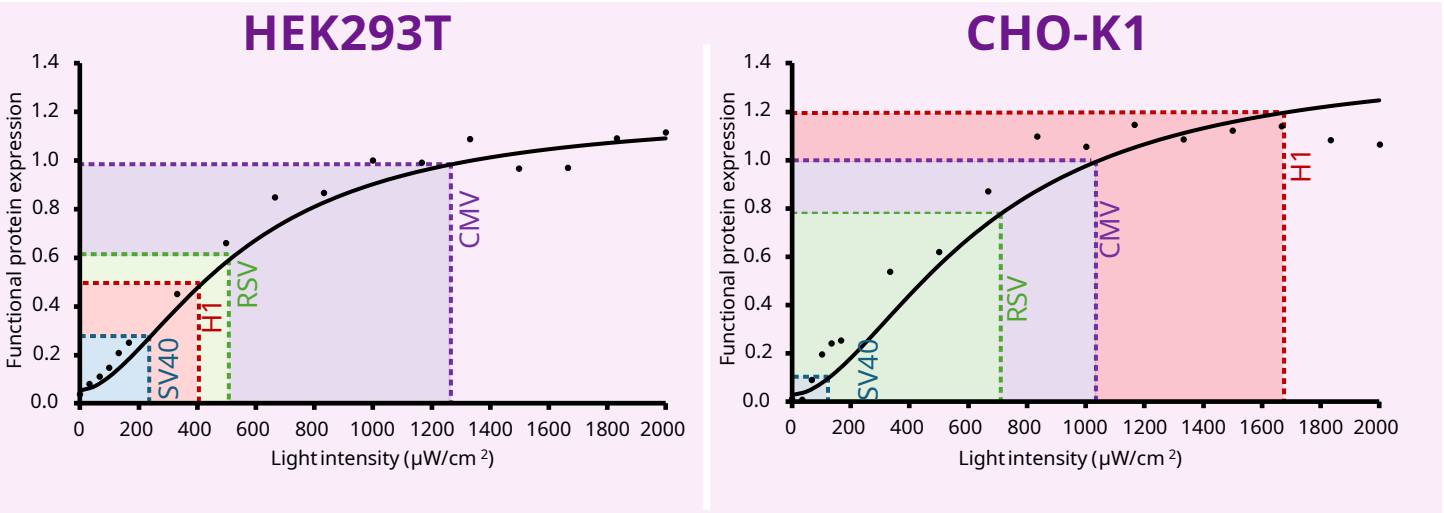

Figure 1: Optogenetic expression tuning **in HEK293T and CHO-K1 cell lines**
Light-dose-dependent expression of functional recombinant proteins, benchmarked against common constitutive promoters. Each data point represents the average functional protein expression from three replicates across eight independent experiments (n=8), as determined by a functional cell-based assay. Samples were excited with continuous blue light (470 nm) for 24 h at indicated intensities. The performance of constitutive promoters is indicated by the intersections between the dotted squares and the trend lines. Each intersection corresponds to the average expression level measured after 24 h of expression without light stimulation. Individual experiments were normalized to CMV values.

CONCLUSION

The optogenetic screening system presented here provides the means to varying transcriptional expression strengths and ratios for optimal (complex) production output. This system can be used to save time and cloning and cell line construction efforts by using optogenetic expression tuning. Using quickly available initial data from transient experimentation, in a second calibration step, suitable benchmarked constitutive promoters can be identified to translate these insights into shortcutting optimization stable cell line development. Additionally, optogenetically controlled expression can be directly employed in expression in stable cell lines.

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