

Transcription factor engineering in CHO cells for recombinant protein production

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The continuous increase of approved biopharmaceutical products drives the development of more efficient recombinant protein expression systems. Chinese hamster ovary (CHO) cells are the mainstay for this purpose but have some drawbacks, such as low levels of expression. Several strategies have been applied to increase the productivity of CHO cells with different outcomes. Transcription factor (TF) engineering has emerged as an interesting and successful approach, as these proteins can act as master regulators; the expression and function of a TF can be controlled by small molecules, and it is possible to design tailored TFs and promoters with desired features. To date, the majority of studies have focused on the use of TFs with growth, metabolic, cell cycle or endoplasmic reticulum functions, although there is a trend to develop new, synthetic TFs. Moreover, new synthetic biological approaches are showing promising advances for the development of specific TFs, even with tailored ligand sensitivity. In this article, we summarize the strategies to increase recombinant protein expression by modulating and designing TFs and with advancements in synthetic biology. We also illustrate how this class of proteins can be used to develop more robust expression systems.