Resting cells likely retain gene expression activity for keeping cells viable

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Abstract

In biocatalysis, cells are frequently only fed with substrates for biotransformation as well as cofactor regeneration. This saves on cost and reduces process complexity. Cells tailored for this type of biocatalysis are known as resting cells. These cells are commonly thought to be viable but not very active except for the biotransformation reaction. However, gene expression activity could still be present in these cells. To think about the above problem, one needs to understand that a viable cell still retains a supply of the cellular energy currency, ATP. More importantly, a living cell has a multitude of cellular building blocks which can be converted to ATP through diverse reactions. For example, the co-substrate for cofactor regeneration in biocatalysis provides intermediates for cellular metabolism that could yield ATP. With ATP and other cofactors, gene transcription and translation activities could occur, and a resting cell remains viable and transcriptionally active. However, the level of gene expression in resting cells is likely to be lower than those of normal cells, and much remains to be known about the regulatory mechanism that governs the expression of individual genes or sets of genes in a regulon. One approach for assessing the gene expression activity of resting cells would be to conduct a time-profile sampling of resting cells from a large population followed by performing a population level RNA-seq. Such a time course profile may yield insights on the type of genes expressed as well as unveiling the cellular logic that decides which are the important genes requiring constant expression. Genes expressed in resting cells are likely housekeeping genes or those able to induce the cells to enter a nutrient deprived survival state.

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