Codon Optimisation

Codon Optimisation for increased Protein Production

In an organism, a protein-coding sequence, as optimised by nature, produces the right amount of protein as needed by that organism. Typically, a sequence is not optimised for large-scale protein production. This is a major challenge for the efficient production of protein-based biologic drugs and industrial enzymes.

The DNA encodes each amino acid in a protein using a combination of three nucleotides called 'codon'. Multiple codons can code for the same amino acid (3.5 on average). Therefore, a protein with 100 amino acids can be coded by ~3.5^{100} possible DNA sequences, an astronomically large number of sequences that cannot be easily explored. Additionally, the codon usage varies significantly from species to species – called codon bias. This is particularly the case due to different translational machinery and associated regulatory systems in different species. Thus optimising codon usage for a particular host expression system can significantly increase the protein expression.

Current methods for Codon optimisation have met with limited success in improving levels of protein expression. These methods typically rely on computer modelling and

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have limited understanding of factors that determine protein expression. Improper changes in codon usage can also impact on efficiency and accuracy of transcription or translation and cause ribosome stalling and consequently alter the expression levels of functional proteins.

The Technology

Griffith University has developed a new method for codon optimisation that utilises both computational modelling and large-scale high-throughput experimental evaluation. The output from this method is a production cell line that highly overexpresses a gene of interest. The high level expression is confirmed quantitatively on the protein level. Our studies in an *E. coli* based expression system have resulted in 5-10 fold increase in protein production. This technique can be potentially applied to any host expression system. We are currently conducting proof of concept studies in CHO cells.

The Team

Prof Yaoqi Zhou and Dr Jian Zhan from the Institute for Glycomics at Griffith University, Gold Coast, Queensland, Australia, are inventors of this technology.

Intellectual Property

Griffith University has full rights to this technology.

The Offer

Griffith University is seeking to partner with companies interested in improving recombinant protein expression levels for products in the pipeline or in the market. We can provide these services under a fee for service arrangement or provide a licence to our technology to interested companies.

Point of Contact

Interested parties are encouraged to contact Mr Ujjwal Dua, Business & Innovation Manager (Life Sciences), Griffith Enterprise.

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