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Chinese Hamster Ovary (CHO) cells are the preferred hosts for the production of therapeutic glycoproteins. However, there is a need for improvement of the bioprocesses towards increased cell growth and higher productivities without compromising the product quality. Efforts to obtain tailor-made products with the desired properties that meet the requirements of regulatory authorities are continuously being made. Of equal relevance is to develop methods to engineer cell lines with improved by-product metabolism.

CHO cells are not efficient at converting substrate into product or biomass. At the moment, up to 50% of the carbon fed to the cells is wasted in toxic non-productive by-products, like lactate and ammonium that accumulate throughout the culture time in mammalian cells, that reduce the potential cell growth rate and protein productivity.

As genome sequences of CHO cell lines and draft genome of *Cricetulus griseus* (Chinese Hamster), alongside genome editing tools like CRISPR/Cas9 are recently available, an “omics” approach for studying the CHO metabolism is now possible. This allows for reengineering cell lines towards a more efficient metabolism and higher cell densities.

The methodology includes reviewing the literature in search of potential targets affecting cell growth and productivity, using CRISPR/Cas9 for genome engineering to knock-out and/or knock-in target genes in order to produce cell lines with improved phenotypes. In addition, for assessment of the genome engineering, DNA-seq, RNA-seq and proteomics are also used. Moreover, the phenotypes of the different clones are characterized in batch and bioreactor cultivations.

The effects of genome engineering of candidate genes are being assessed alongside data on specific rates for uptake and formation of nutrients, metabolites and by-products. Based on these, enhanced CHO cell lines potentially producing reduced amounts of by-products will confirm the success of the cell line engineering strategy.