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James, David (2014) Design and Engineering of Next Generation Mammalian Cell Factories. In: USES 2014 - The University of Sheffield Engineering Symposium, 24 June 2014, The Octagon Centre, University of Sheffield.

<https://doi.org/10.15445/01022014.24>

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Design and Engineering of Next Generation Mammalian Cell Factories

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Abstract

Recombinant protein biopharmaceuticals are the top selling class of drugs, with global annual sales exceeding 100 billion USD. The majority of biopharmaceuticals are currently made in Chinese hamster ovary (CHO) cells, a transformed cell type originally isolated in the 1950's. The adaptability and utility of CHO cell factories derives from our exploitation of their acquired genetic/functional variation using high-throughput functional screening and selection processes which enable industry to isolate and maintain cell factories with unusual and desirable properties. However, we still have a limited understanding of enabling cellular mechanisms that underpin the ideal manufacturing phenotype. This knowledge would permit design and construction of intrinsically better cell factories using the new concepts and tools of systems and synthetic biology. We now have the potential to provide disruptive new solutions for cell and process engineering, where we will be able to create bespoke cell factories with a predictable ability to manufacture a new generation of more complex biopharmaceutical proteins.