Imperial College London

Artificial Golgi Reactor for Tailoring Glycans

A novel platform comprising immobilized enzymes to produce homogenously glycosylated proteins for therapeutic or diagnostic applications.

Proposed use

Researchers at Imperial have developed a novel platform, the Artificial Golgi Reactor, to address the heterogeneous sugar profile of antibodies in a cell-free environment. The platform consists of sequential reactions utilizing immobilized glycosylation enzymes that are spatially separated to avoid glycan heterogeneity.

Problem addressed

Therapeutic proteins, such as monoclonal antibodies (mAbs), are used as an effective drug against cancer, autoimmune disorders and for bacterial and viral infections. Glycosylation, the post-translational enzymatic addition of sugars, is a key quality attribute of proteins known to affect drug functionality, stability and efficacy. However, as therapeutic proteins are primarily produced in cell-based systems, there is a large degree of sugar heterogeneity owing to enzyme competition, the lack of orderly reactions and limited availability of reaction components. The heterogeneous glycan profile leads to mixture of product structures with different stability and efficacy characteristics.

Technology overview

The tightly controlled reaction conditions in the Artificial Golgi Reactor allow the production of highly homogeneous (>95%) mAbs and other therapeutic proteins. This novel strategy is applied post-expression and can be coupled with various expression systems (e.g. Chinese hamster ovary (CHO), human embryonic kidney (HEK), *Pichia pastoris* cells etc.) to fine-tune the glycan structures of protein therapeutics. Importantly, the system can be used to tailor the glycan profile of biosimilars and biobetters in accordance with regulatory requirements.

Intellectual property information

Priority Application Greece (Number: 20210100201)

Supplemental Application United Kingdom (Number: 2106646.9)

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Benefits

- The design is modular and can be adapted for any desired sugar composition
- The design can be used as plug-and-play approach to add sugars on proteins derived from cell-based or cell-free systems
- Increased system stability due to immobilised enzymes allowing long term storage without significant loss of activity
- Immobilisation allows enzyme reusability for multiple reactions, lowering the cost and offering a sustainable solution

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