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Synthesis of Glycoproteins using Modified Bacterial Ribosomes

Glycoproteins play an important role in numerous cellular and biological processes such as intercellular communication and trafficking, immune functions, cell-cell recognition, hormones, reproduction, embryonic development and more. They are also closely associated with a number of diseases like cancer and immunodeficiency diseases. In nature, the formation of glycoproteins is a complex process that primarily occurs through posttranslational modifications. No straightforward or general system to create glycoproteins with high yields has been devised.

Researchers at the Biodesign Institute of Arizona State University have developed novel methods to modify ribosomes so that they mediate site-specific incorporation of glycosylated amino acids into proteins or peptides. Among other applications, these methods and modified ribosomes enable the creation of homogenous glycosylated proteins and peptides using in vitro translation systems. While, post-translational modifications of proteins have previously focused on protein structure at the whole cell level, these ribosomes would provide access to enough quantities of homogenous glycoproteins to enable putative pathways to be probed directly. These methods could also be used to produce specifically glycosylated proteins in intact cells. Four modified murine interferon- β s were created and tested with one showing a 10-fold increase in antiviral potency compared to non-glycosylated IFN- β .

This technology is a fundamental discovery for directly expressing glycosylated peptides and proteins that is likely to enable numerous applications in a variety of fields.

Potential Applications

- Modified ribosomes for the discovery, optimization and production of homogenous glycoproteins
 - o Therapeutics
 - o Research

Particularly helpful for discovering glycosylation sites that affect activity

Studying cellular processes including protein aggregation and misfolding

- o Enzymes
- o Biomaterials

Benefits and Advantages

- Increased suppression yields
- Enhanced ribosomal incorporation of glycosylated amino acids into proteins
- High protein yields - enough glycoprotein yield for biochemical experiments
- The glycosylated amino acids are incorporated at predetermined sites of interest
- o Can be obtained in homogeneous form, which is normally very difficult to do
- Enables in cellulo incorporation of modified amino acids

For more information about the inventor(s) and their research, please see

[Dr. Hecht's departmental webpage](#)