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Sulfation of Therapeutic Proteins in Plants

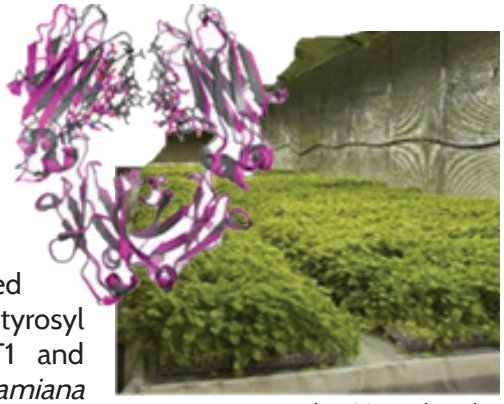
The present invention relates to the use of Tyrosylprotein Sulfotransferase (TPST) in plant-based protein expression systems to ensure appropriate sulfation patterns of therapeutic proteins. The offered technology enables engineering of plants in such a way that they can sulfate proteins like mammals, which will increase the versatility of plant-based protein production systems.

BACKGROUND

An important modification of certain therapeutic proteins for optimal functionality is sulfation, the attachment of sulfate to certain tyrosine residues. Such proteins include among others clotting factors, anti-HIV mAbs or HIV vaccines. Plant cells have already been modified to recombinantly produce proteins having human-like glycosylation. However, strategies to sulfate recombinantly produced proteins of animal origin in plant cells have not been established yet.

TECHNOLOGY

The present invention addresses the challenges of posttranslational modifications in plant-based expression systems by enabling human-type protein sulfation in plants.



anti-HIV mAb PG9 produced in *N. benthamiana*

In humans, protein sulfation is carried out by two closely related tyrosyl protein sulfotransferases (hsTPST1 and hsTPST2). However, *N. benthamiana* does not sulfate proteins in a 'mammalian way' and thus is currently not a suitable production system for therapeutic proteins as PG9 (anti-HIV mAb). The offered technology overcomes this drawback by showing *in vivo* that expression of chimeric hsTPST1 in *N. benthamiana* results in a degree of sulfation comparable to that obtained in CHO cells (roughly 80%). Moreover, the innovative plant-based expression system produces anti-HIV-1 antibodies with effector functions superior to PG9 made in CHO cells by combining glycan modulation and sulfoengineering.
Using the novel technology it was shown for the first time that human-type sulfated therapeutic proteins can be produced in plants opening new perspectives for an easy large-scale production of sulfated proteins.

BENEFITS

- Native-like sulfation of proteins in plant-based protein expression systems
- Improving functionality of therapeutic proteins
- Comparable sulfation pattern as in CHO cells
- Compatibility with other advantages of plant-based expression platforms (glycan homogeneity, flexibility, production speed, ease of large-scale production)

REFERENCE:
P1405101

COOPERATION OPTIONS :
- License Agreement
- Collaboration
- Purchase

KEYWORDS:
Tyrosylprotein Sulfotransferase, Sulfation, Plant-based protein production

DEVELOPMENT STATUS:
Proof of Concept *in vitro*

IPR:
EP application filed on 20th of April 2015

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FURTHER READING:
Loos et al. "Glycan modulation and sulfoengineering of anti-HIV-1 monoclonal antibody PG9 in plants". PNAS 112 (2015), 12675-80

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