

## 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.

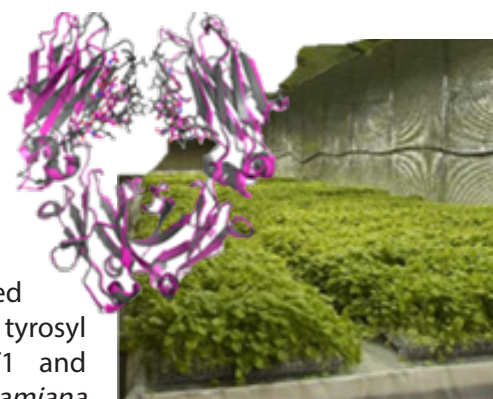
### BACKGROUND

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.

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.



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

### 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:  
2014-16

### OPTIONS :

- License Agreement
- Collaboration
- Purchase

### KEYWORDS:

Tyrosylprotein Sulfotransferase, Sulfation, Plant-based protein production

DEVELOPMENT STATUS:  
Proof of Concept *in vitro*

### IPR:

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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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