

# Gly-it enables sugar-on-sugar linkages

## Introduction

Our GLY-IT glycosylation platform now offers added functionality for constructing small oligomeric structures.

Adding single sugars to APIs and ingredients is a proven way to improve solubility, physical properties, ADMET and taste. But moving to carbohydrate oligomers can take these improvements even further.

Vaccine adjuvants (saponins), colors (anthocyanins, crocetin) and low-calorie sweeteners (stevia, mogroside) are all examples where oligomeric sugar structures play important roles for molecular functionality, respectively: immunogenicity, color and taste.

Our expanded platform now enables you to construct 1,3-, 1,2- and 1,6- sugar-on-sugar bonds between a variety of sugar monomers. We can provide this either as a do-it-yourself kit or as a service.

If you would like to explore what glycosylation could do for you, or your molecules, we would be happy to take an introductory conversation

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Glycosylation offers remarkable opportunities for improving the characteristics, use and production of small molecules that are not currently being taken advantage of. GLY-IT has significant proprietary knowledge and a collection of diverse enzymes that have the potential to help our customers to do just that.

## Anthocyanins

Anthocyanins are the colored flavonoid derivatives which give us much of the color in plants in nature. They are also used as food colorants. They are usually multi-glycosylated and the precise glycosylation pattern is crucial for color hue, solubility and stability of the molecules. Further, stabler natural derivatives are called arboxypyrananthocyanin and, in a nice study from 2018, Farr et al. showed that the precise bond between di- or tri-glycosides of the partaking anthocyanins (1,2 vs. 1,6) was paramount for stability.

## Saponins

Due to their surfactant properties, glycosylated triterpenes and steroid structures are termed saponins. Saponins of vast diversity exist in nature and are particularly distinguished by their glycosylation pattern. In a new study, Thu et al. (2021) show nicely how a multitude of different saponins from two plant species differ dramatically in biological activity (anti-inflammation, anti-microbial & anti-proliferation), depending on the number of sugars, type of sugars and inter-sugar bond specificity.

## Stevia & mogroside

The two most promising natural sweeteners are highly glycosylated terpenes made by the Luo Han Guo fruit (the mogrosides) and *Stevia rebaudiana* leaves (the rebaudiosides). Mayank (2015) describes the underlying mechanistic of human taste reception that leads to the superiority of Rebaudioside M as sweetener, while Olsson et al. (2016) show the intricacy of the enzymatic machinery needed to make the 1,2-, 1,3 and 1,6-bonds necessary for making this molecule. Similar structure-function relationships are found for mogrosides (Itkin et al., 2016).

*Farr et al. (2018). Food Chem. 259: 261*

*Itkin et al. (2016). Proc. Natl. Acad. Sci. 113: E7619*

*Mayank (2015). Phytochemistry 116:12*

*Olsson et al. (2016). Microb. Cell Factories 15: 207*

*Thu et al. (2021). Molecules 2021, 26: 1916*



### What is the Gly-it platform?

The Gly-it platform is a library of 380 diverse "Family 1" UDP-glucose dependent glycosyltransferase enzymes (UGTs) plus associated screening, analytical and lab scale production protocols ("Family 1" denotes glycosyltransferases that will glycosylate small molecules).

All the enzymes in Gly-it are found in plants (which have diverse UGTs to work with the diverse range of small molecules that occur in plants or their environment). The library contains enzymes from all known Family 1 UGT sub-families and sub-sub-families and from a wide set of evolutionarily diverse plants.

The majority of the enzymes will be able to add glucose to small molecule substrates with relevant functional groups. Some enzymes will work with other sugars (such as xylose, rhamnose, galactose or glucuronic acid). We can advise you on the best path for specific sugars.

**We realize that this may be your first step in determining if Gly-it technology will be able to help you in your current project. We are happy to assist you in determining if Gly-It is the right fit.**

To discuss, or for more help, just get in touch. We would like to make sure Gly-it is a proper fit for your current goals.

**To email us directly**  
[contact@gly-it.com](mailto:contact@gly-it.com)

**To call us directly**  
Pharma enquiries: +45 28 717 717  
Other enquiries: +33 7 85 04 84 18