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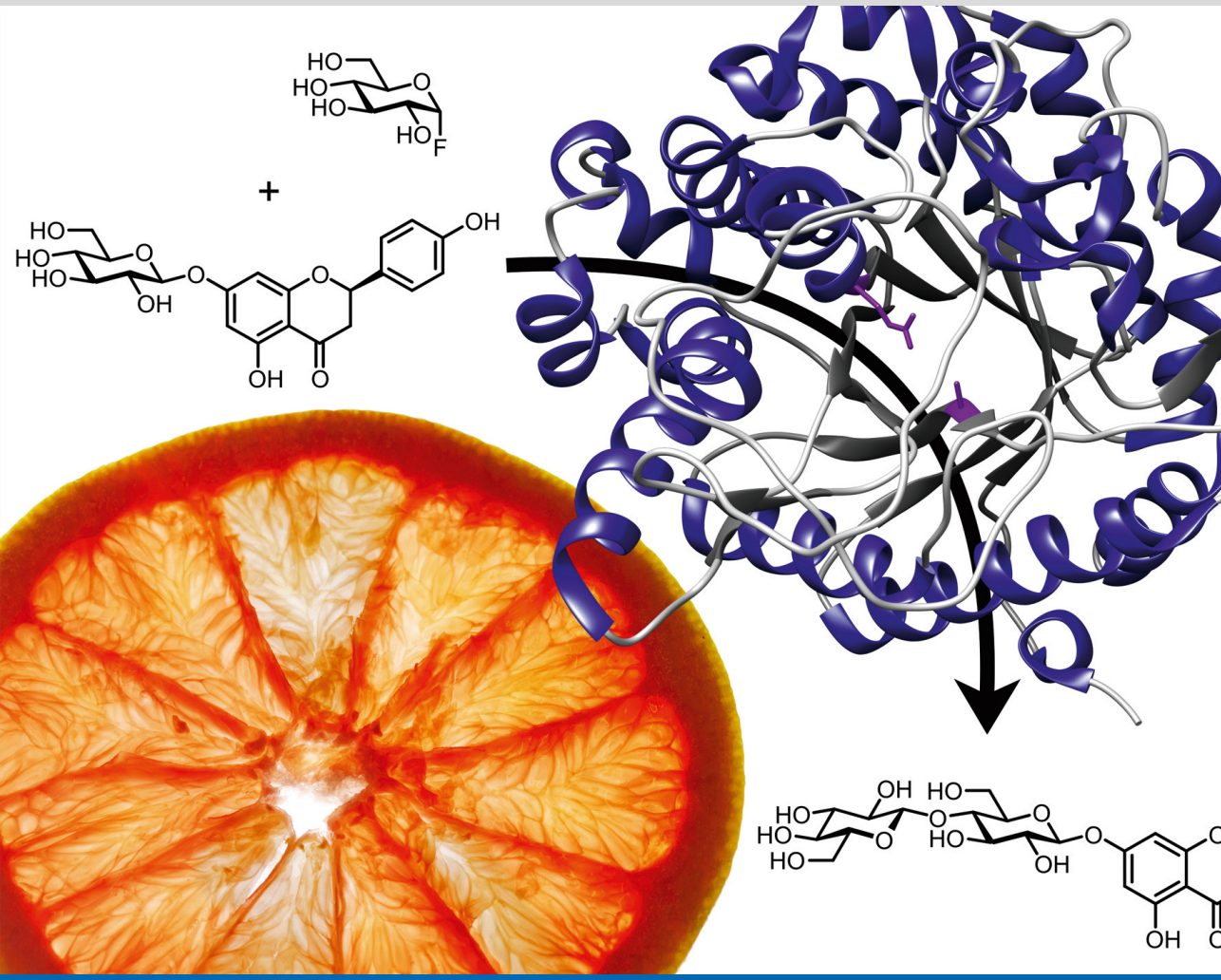
Glycosynthases – tuning glycosidase activity towards glycoside diversification and synthesis

Marc Richard Hayes



Bioorganische Chemie an der Heinrich-Heine-Universität im Forschungszentrum Jülich

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Herausgegeben von Jörg Pietruszka

The most abundant biological molecules on earth are carbohydrates. They cover the surface of all cellular organisms and are added to the structure of numerous molecules produced by these cells. Glycosides are essential for the given biological and physicochemical properties of a specific compound, and exert a major influence on cell recognition, health and immunity, the functionality and stability of peptides, and many other processes throughout biology.

Due to the large impact of glycosylation, the demand for simple methods for the synthesis of defined glycosides is constantly rising. The use of enzymes such as glycosyltransferases, glycosidases, and glycosynthases capable of transferring or hydrolysing glycosidic structures has gained much interest by organic chemists. This thesis focussed on the development of new glycosynthases with the aim of creating a versatile biocatalytic toolbox for glycosylation and glycodiversification in organic synthesis.

The objective was approached in four projects, each focussing on a different aspect of the glycosylation reaction carried out by glycosynthases. These encompassed the influence of temperature on the glycosylation reaction by applying mutated glycosidases with extremophilic properties; a substrate based approach to glycosynthase development in order to enable glycosylation of phenolic compounds; studies toward the development of an α-L-rhamnosynthase; and the transfer of large glycoside structures to small molecules by *endo-N*-acetylglucosaminidases.

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