

**Title:**

**From Glycogen to Starch – Cyanobacteria as Production System for Carbon Containing Products**

**Authors & affiliations:**

*Oberleitner, Sandra*      *University of Applied Sciences Upper Austria*  
*Richter, Juliane*        *University of Applied Sciences Upper Austria*

**Abstract:**

Nearly 29 gigatons of CO<sub>2</sub> are exhaled by humans every year, which influence earth's climate significantly. A decrease of this amount combined with production of valuable products sounds like a futuristic idea. But in fact, photosynthesis uses CO<sub>2</sub> to synthesize carbon-containing products and is performed by prokaryotes such as cyanobacteria. For this reason, cyanobacteria provide a promising approach to convert CO<sub>2</sub> into valuable products. Starch could be such a product with regard to its versatile application in aqua feed, paper industries, processed food, animal and pet food as well as pharmaceuticals and cosmetics. Unfortunately, starch is not naturally produced by cyanobacteria. Here, glycogen is synthesized, which consists of a higher linkage grade of  $\alpha$ 1.4 and  $\alpha$ 1.6 glucose compared to starch.

The starch production will be performed in two steps: In a first step, the amount of glycogen precursors will be increased by overexpression of four genes, which are part of the glycogen synthesizing pathway. Therefore, four expression vectors each including one of the genes each regulated by the light induced promoter Pcp560 and a selection marker were created. In a second step, the endogenous branching enzyme will be exchanged by a eukaryotic one to convert the build glycogen into starch. All expression constructs will be integrated into the genome of *Synechocystis* sp. PCC 6803 via homologous recombination. Afterwards, the genomic integration as well as protein production will be checked next to the determination of the linkage grade of the build product.