# CORENZ

Cofactor Regeneration in Enzymatic Systems

Institute for Applied Biotechnology (IAB)

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| **Project leader** | Prof. Dr. Hartmut Grammel |
| **Researcher** | Andreas Witt, Beryl Cancro |
| **Financing** | Bundesministerium für Bildung und Forschung |
| **Program** | Biotechnologie 2020plus - Basistechnologien für eine nächste Generation biotechnologischer Verfahren |
| **Partners** | Max-Planck-Institut für Dynamik komplexer technischer Systeme, Magdeburg |
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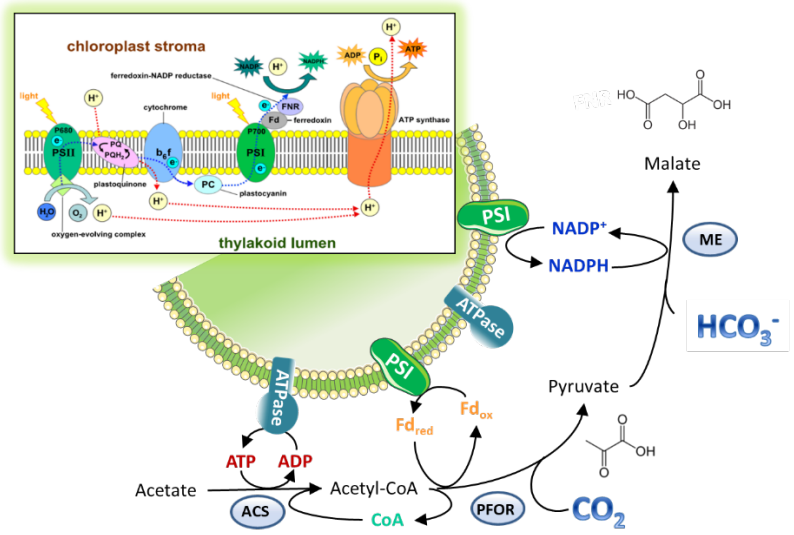
**Project description**

The problem of rising $CO_2$ levels in the atmosphere as a major cause of global warming, makes it highly attractive to utilize $CO_2$ as raw material for producing chemicals. Biocatalytic conversion using $CO_2$-fixing enzymes is particularly interesting since enzymes generally operate with high specificity and selectivity at moderate environmental conditions. We recently demonstrated that natural decarboxylases can be operated in the reverse $CO_2$-fixing direction in synthetic combinations with low potential redox cofactors *in vitro* (1). We now incorporated further enzymes to establish a synthetic linear pathway for conversion of acetate and $2CO_2$ to the C4-dicarboxylic acid malate. However, enzymatic reactions often depend on cofactors which have to be continuously replenished and lead to high costs in running biocatalytic systems. Furthermore, the accumulation of the used cofactors may cause inhibitory effects and reduce overall efficacy.
This project addresses the issue of enzymatic conversion of $CO_2$ including cofactor recycling within a sustainable closed circular process. As cofactor

recycling module illuminated chloroplast are incorporated to regenerate the cofactors ATP, NADPH, ferredoxin, and coenzyme A.
The pathway potentially provides a biocatalytic route to C4 dicarboxylic acid platform chemicals with $CO_2$ as a substrate.

(1) Witt A, Pozzi R, Diesch S, Hädicke O, Grammel H. 2019. New light on ancient enzymes – in vitro $CO_2$ fixation by pyruvate synthase of *Desulfovibrio africanus* and *Sulfolobus acidocaldarius*. FEBS J. 286(22):4494-4508. doi: 10.1111/febs.14981.



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