# Sustainable production of biochemicals by CO2 -fixing cell factories

**Lesiak, Justyna; Baureder, Michael; Ammam, Fariza; Zhang, Tian; Zengler, Karsten**

*Published in:*
Book of Abstracts. DTU's Sustain Conference 2015

*Publication date:*
2015

*Document Version*
Publisher's PDF, also known as Version of record

# Sustainable production of biochemicals by $CO_2$ -fixing cell factories

Justyna Maria Lesiak[1]*, Michael Baureder[1], Fariza Amman[1], Tian Zhang[1] and Karsten Zengler[1]

1: DTU Biosustain

*Corresponding author email: jusles@biosustain.dtu.dk

Industrialization has led to a drastic increase in the carbon dioxide emissions, causing a global climate change, and actions to counteract this problem need to be taken. It is possible to reduce the atmospheric $CO_2$ levels by using it as a cheap, accessible and ubiquitous carbon source for gas fermenting bacteria, and manipulate them to synthesize valuable multicarbon organic compounds. Existing pilot plants for the production of ethanol from i.e. steel mill exhaust gas have shown the feasibility of the concept.

We employ molecular biology tools for metabolic engineering of the gas fermenting bacterium *Clostridium ljungdahlii* to manipulate cell's natural carbon flow and create amino acids producing cell factories. The major challenge in amino acid production is the direct feedback inhibition of key enzymes by the end products at multiple steps of the biosynthesis pathways. To overcome this limitation we constructed feedback inhibition resistant (fbr) variants of the crucial enzymes by directed mutagenesis and used strong promoters to overexpress the modified enzymes. Additionally, the developed markerless deletion/insertion system for *C. ljungdahlii* should create new possibilities to genetically modify the organism, eliminating the necessity to use antibiotic selection for modified strains.