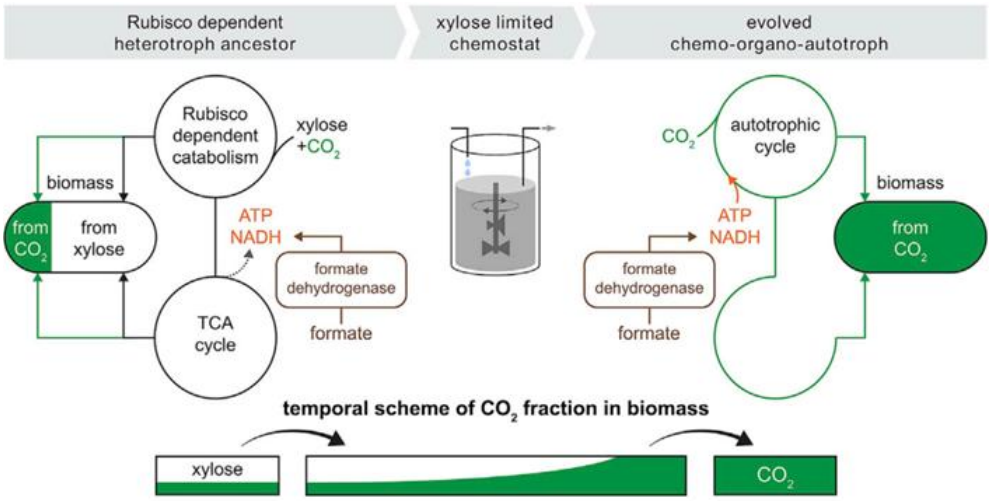
Carbon Fixing Bacteria

Climate Tech

Reference Number: **1736** \ Principal Investigators: **Prof. Ron Milo** \ Patents: **WO2021084526A1, WO2015177800A2**

A bacteria (E. coli) engineered to fix atmospheric CO_2, converting it into organic biomass.

This breakthrough synthetic biology approach enables E. coli to use CO_2 as its sole carbon source by harnessing energy from formate, offering a potential solution to the major global challenge of reducing atmospheric CO_2 levels and a potentially unique platform for precision fermentation.



Experimental workflow: Engineered E. coli unable to grow autotrophically were cultured with limited xylose and excess formate/CO_2. Under this pressure, cells evolved to use CO_2 as the sole carbon source and formate for energy, leading to fully autotrophic clones that outcompeted the original strain.

APPLICATIONS

- Potential Precision Fermentation Platform: A modular platform for producing various chemicals with net negative CO_2 emissions by integrating synthetic metabolic pathways.
- Research Tool: Useful for studying and improving enzymes in the Calvin-Benson-Bassham (CBB) cycle, contributing to advancements in crop efficiency.

STAGE OF DEVELOPMENT

The Milo team has developed and characterized carbon-fixing strains of E. coli, demonstrating autotrophic growth through continuous laboratory evolution. These strains have been validated via carbon economy assessments and genomic sequencing to identify the mutations that support autotrophy.

ADVANTAGES

Genetic Engineering Compatibility: E. coli-based standard laboratory techniques can be applied for genetic modification.

Sustainable: Provides a way to sequester atmospheric CO_2

REFERENCES

- Gleizer et al., Cell, 2019