From Problem to Project

Image of oil sands tailings ponds.
Alkanivore

A Toolkit for Enabling Hydrocarbon Conversion in Aqueous Environments
Enabling Hydrocarbon Conversion in Aqueous Environments
Enabling Hydrocarbon Conversion in Aqueous Environments
Enabling Hydrocarbon Conversion in Aqueous Environments

- Conversion
- Regulation
- Survival
- Solubility
Alkanivore

Enabling Hydrocarbon Conversion in Aqueous Environments

Conversion  Regulation  Survival  Solubility
Conversion
n-alkanes

R

n-alkanol

R

n-alkanal

n-alkanoic acid

β-Oxidation + TCA

ADH

ALDH
Enzyme activities

- **AlkB2**
  - 8-C: μmol min⁻¹ g⁻¹ dry weight
  - 16-C: μmol min⁻¹ g⁻¹ total protein

- **LadA**
  - 16-C: μmol min⁻¹ g⁻¹ total protein

- **ADH**
  - 12-C: μmol min⁻¹ g⁻¹ total protein

- **ALDH**
  - 12-C: μmol min⁻¹ g⁻¹ total protein

**n-alkanes** → **n-alkanol** → **n-alkanal** → **n-alkanoic acid**
RBS characterizations

![Bar chart showing relative strength of RBS characterizations for various Anderson Family Members and a reference (Ref)].

- Relative strength (100% = B0034):
  - J61117: 8%
  - J61100: 16%
  - J61127: 24%
  - J61107: 32%
  - J61101: 40%
  - B0032 (Ref): 100%
Enabling Hydrocarbon Conversion in Aqueous Environments

Conversion  Regulation  Survival  Solubility
Regulation
Regulation pCaiF
Regulation pCaiF

Glucose phase
Regulation pCaiF

Substrate limited phase
Salt Tolerance
Enabling Hydrocarbon Conversion
in Aqueous Environments

Conversion
Regulation
Survival
Solubility
Salt Tolerance

Growth rate (h⁻¹) vs NaCl (M)

<table>
<thead>
<tr>
<th>NaCl (M)</th>
<th>Growth rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0%</td>
</tr>
<tr>
<td>0.2</td>
<td>25%</td>
</tr>
<tr>
<td>0.3</td>
<td>50%</td>
</tr>
<tr>
<td>0.4</td>
<td>75%</td>
</tr>
<tr>
<td>0.5</td>
<td>100%</td>
</tr>
</tbody>
</table>

E.coli WT and Salt tolerance strain growth rate comparison.
Solvent Tolerance

Growth rate (h⁻¹) vs. n-hexane (%)

- E. coli WT
- Solvent Tolerance strain
- Growth rate %

Growth rate increase (%)
Homolog Interaction Mapping

- Known Interactions
- Putative Interactions

Homologs

Source organism
Target organism
Enabling Hydrocarbon Conversion in Aqueous Environments

Conversion  Regulation  Survival  Solubility
Solubility
Solubility

Absorbance (493nm)

E.coli WT  AlnA strain
Solubility

Absorbance (493nm)

E.coli WT
AlnA strain
Enabling Hydrocarbon Conversion in Aqueous Environments

Conversion  Regulation  Survival  Solubility
Scientific Achievements

Added 16 BioBricks to the Toolkit

Developed methods for characterization

Proof of principle for all 4 sub-parts
Future prospects

Oil contaminated water → Clean water

R

O₂ → CO₂ → Biomass
Who decides about the applications of synthetic biology?

Don't let only commercial interests, but also the society, decide about the application of synthetic biology.

Making machines is natural, including 'living machines' ...?

Too beautiful to imagine: a living machine that makes something useful and which is also able to replicate itself.

How far can we go with engineering new life?

By engineering new life forms we exceed a moral boundary.
Media Attention

Dutch National News

Nanopodium
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References


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