

Polyethylene terephthalate (PET) monomer metabolism and adaptation in environmentally isolated bacteria

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Isolation and analysis of candidate strains:

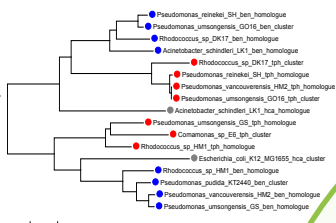


Bacteria isolated from soil and water under selective pressures

+ TA
+ EG
30 °C
32.5 °C
35 °C

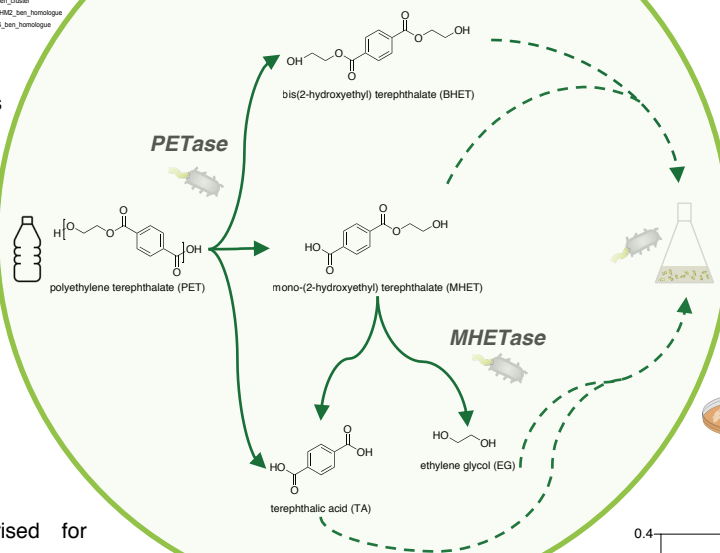
Isolate	Species
LK1	<i>Acinetobacter schindleri</i>
LK2	<i>Aeromonas media</i>
HM1	<i>Rhodococcus</i> sp.
HM2	<i>Pseudomonas vancouverensis</i>
SH	<i>Pseudomonas reiukei</i>
GS	<i>Pseudomonas umsongensis</i>
TS	<i>Ralstonia</i> sp.
FS	<i>Ochrobactrum intermedium</i>

Isolates identified by genome sequencing



Genomes analysed to identify candidate genes relating to plastic degradation

Enzymatic PET degradation and consumption of PET monomers



Production of PET degrading enzymes:

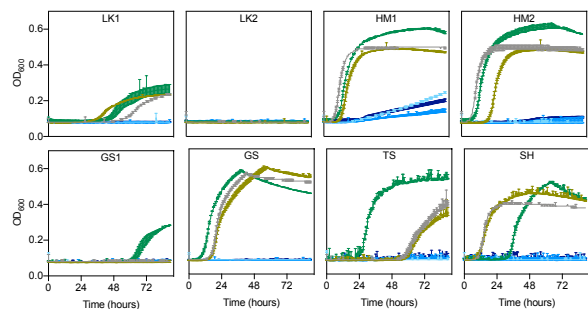


Bacteria are engineered to produce PET degrading enzymes

Engineered bacteria secrete enzymes to degrade PET into its constituent monomers

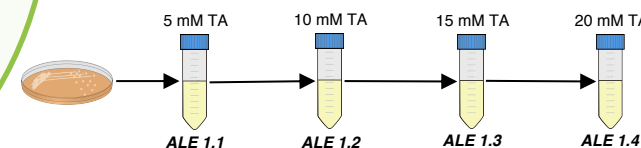
BHET
MHET
TA
EG

PET monomers as microbial feedstock:

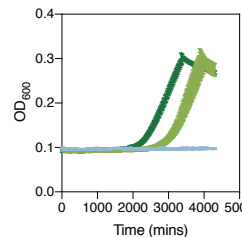


Strains are characterised for growth using PET monomers as a sole carbon source, across a range of increasing temperatures

Adapted laboratory evolution:



Bacteria are subjected to artificial selection pressures to drive adaptation towards growth on target substrates



Tolerance to PET monomers as a sole carbon source improves across successive generations

Adapted strains achieve greater growth rates following prolonged exposure to PET monomers

Impacts and future use:

Bacteria capable of degrading waste PET, and utilising PET monomers, can be integrated into the circular economy to produce high-value products from PET waste

Acknowledgements:

Imperial College
London

