Improving the economics of poly-ß-hydroxybutyrate (PHB) production based on polymerisation of secreted monomers

David J Leak, University of Bath, Maria Sotenko, Activatec Ltd. & Nick Cheffins, Black Jumper Ltd.

Summary

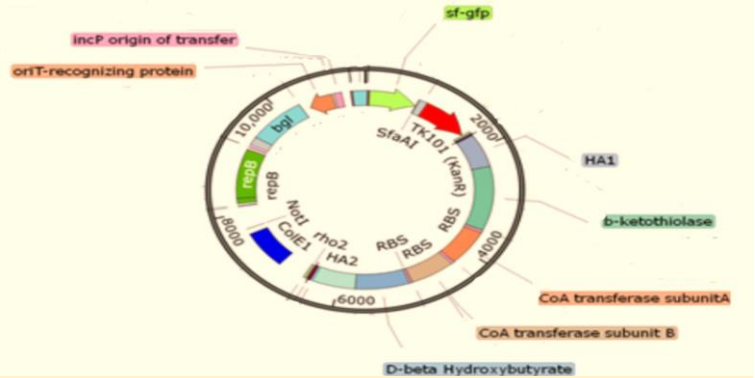
This project explored a different, more cost-effective way to produce poly β-hydroxybutyrate, a biodegradable plastic currently produced as an intracellular polymer by some bacteria with many potential uses. The cost of production limits its use to specialist applications (e.g. medical).

Aims

- Demonstrate that it is possible to make PHB by producing the monomeric R-β-hydroxybutyrate in high titres as a secreted product and polymerise it chemically.
- Allow production from a wider range of substrates and improve the economics of production by removing the dependence on cell yield (ie g PHB > g cell).

Outcomes

- Bacteria were engineered to produce extracellular R-β-hydroxybutyrate from hexose/pentoses derived from municipal solid waste.
- R-β-hydroxybutyrate was purified from fermentation broths and polymerised
- Conversion efficiencies need to be improved to make R-β-hydroxybutyrate the sole product (so that g PHB > g cell)



"In this project we have shown that the concept of producing β-hydroxybutyrate as a secreted pseudo-fermentation product and conversion to PHB is feasible" David Leak, University of Bath

This proof-of-concept project was awarded by the Biomass Biorefinery Network and funded by BBSRC. For more information visit bbnet-nibb.co.uk.