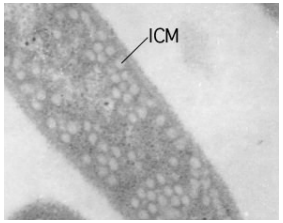
Advancing *Rhodobacter sphaeroides* as a platform for expression of functional cellulose synthase and other membrane proteins

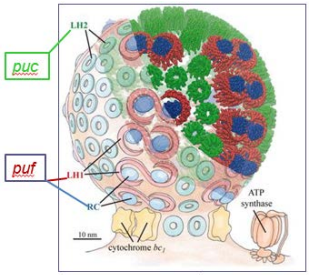
Scientific Achievement

We show that *R. sphaeroides* can express bacterial cellulose synthase BcsAB complex in functional form, as well as a variety of other membrane proteins.

E. coli

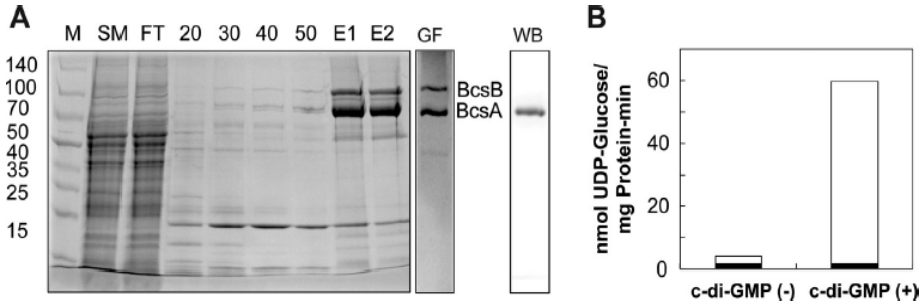


R. sphaeroides



Sener et al., 2007

Compared to *E. coli*, *Rhodobacter sphaeroides* has 10X larger membrane area available to express foreign membrane proteins, and it makes no inclusion bodies.



A: Expression and BcsAB; B: Activity of BcsAB

Erbakan M, Curtis BS, Nixon BT, Kumar M, Curtis WR. (2015) Advancing Rhodobacter sphaeroides as a platform for expression of functional membrane proteins. Protein Expr. Purif. pii: S1046-5928(15)00127-8. doi: 10.1016/j.pep. 2015.05.012

Significance and Impact

This study advances our ability to express cellulose synthase in a catalytically active form, to advance our understanding cellulose formation. Our study also provides a platform for expressing functional forms of many membrane proteins that have so far eluded expression.

Research Details

- *Increased biomass of Rhodobacter 4-fold by employing photoheterotrophic growth;*
- *Showed strong expression of recombinant membrane proteins using the light sensitive puc promoter, normally controlling expression of a light antenna protein – unused membrane available for the recombinant proteins;*
- *Increased yield of functional, BcsAB cellulose synthase 10-fold over E. coli – based system;*
- *Demonstrated expression of functional forms of challenging membrane proteins including human aquaporin 9, human tight junction protein occludin, E. coli toxin GhoT, and cytochrome-cy.*

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