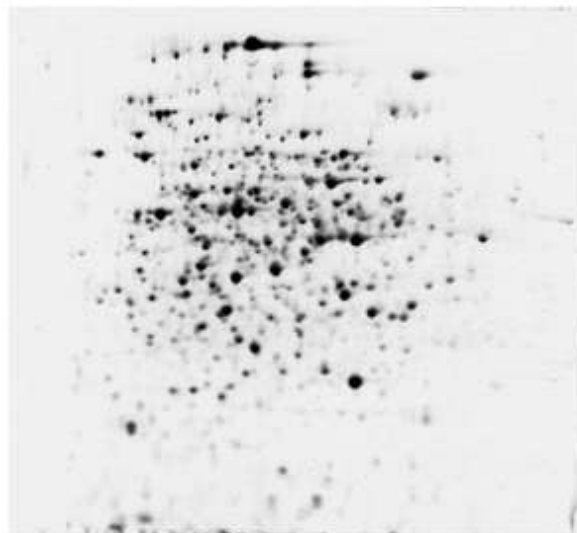
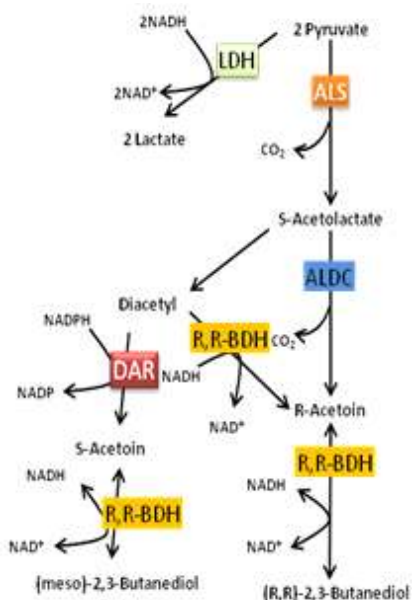


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## Description:

Optically active 2,3-butanediol has important applications in asymmetric synthesis of valuable chiral specialty chemicals and in cosmetics industry. *Paenibacillus polymyxa* ATCC12321 can produce R,R-2,3-butanediol with up to 97% enantioselective purity, making the bioprocess a unique and inexpensive route for large-scale production of optically active 2,3-butanediol. However, due to the relative low yield and complex by-product composition, the bioprocess has not yet been established at an industrial scale.

Driven by the increasing industrial need on optically active R,R-2,3-butanediol and the rapid development of post genomic techniques, we initiated a systems biotechnology approach aimed at the development of a new-generation of R,R-2,3-butanediol producer for an integrated biological production process. We have sequenced the *P. polymyxa* ATCC 12321 and functionally characterized a novel R,R-2,3-butanediol dehydrogenase (Bo et al. 2011). Molecular characterization, metabolic engineering, proteomic and metabolomic analyses are being used to investigate the molecular mechanism by which *P. polymyxa* can specially synthesize optically active or inactive form of butanediol in different fermentation conditions (Fig.1 & Fig.2).



**Fig: 1** Butanediol stereoisomers formation in *P. polymyxa*      **Fig: 2** 2DE proteome pattern of *P. polymyxa* in the pH range of 4-7

With the metabolomic approach we aim at the identification of bottlenecks in the metabolic network of the 2,3-butanediol pathway. Furthermore we want to identify the pathways responsible for by-products and extracellular polysaccharide production to find starting points for genetic modifications. For this metabolite analysis we use a fully automated rapid-sampling-unit for fast and reliable sampling and quenching of the true physiological state of the microorganisms (refer to the project on fast sampling).

On the basis of the “omics” results, new strategies for metabolic engineering, optimization of R,R-2,3-butanediol production are being studied. A hyperproducer with high yield of R,R-2,3-butanediol and less or no by-products and corresponding cultivation and separation technologies are our final goals.

## References:

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