Global transcriptional response of solvent-sensitive and solvent-tolerant Pseudomonas putida strains exposed to toluene - DTU Orbit (22/12/2018)

Pseudomonas putida strains are generally recognized as solvent tolerant, exhibiting varied sensitivity to organic solvents. Pan-genome analysis has revealed that 30% of genes belong to the core-genome of Pseudomonas. Accessory and unique genes confer high degree of adaptability and capabilities for the degradation and synthesis of a wide range of chemicals. For the use of these microbes in bioremediation and biocatalysis, it is critical to understand the mechanisms underlying these phenotypic differences. In this study, RNA-seq analysis compared the short- and long-term responses of the toluene-sensitive KT2440 strain and the highly-tolerant DOT-T1E strain. The sensitive strain activates a larger number of genes in a higher magnitude than DOT-T1E. This is expected because KT2440 bears one toluene tolerant pump, while DOT-T1E encodes three of these pumps. Both strains activate membrane modifications to reduce toluene membrane permeability. The KT2440 strain activates the TCA cycle to generate energy, while avoiding energy-intensive processes such as flagellar biosynthesis. This suggests that KT2440 responds to toluene by focusing on survival mechanisms. The DOT-T1E strain activates toluene degradation pathways, using toluene as source of energy. Among the unique genes encoded by DOT-T1E is a 70kb island composed of genes of unknown function induced in response to toluene.