Rhodotorula mucilaginosa as a catalyst in biotransformation of phosphonates

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As asymmetric organic synthesis has its challenges, which is the use of expensive asymmetric catalyst or harmful reagents, the application of biocatalysis is an attractive alternative. Enantiomers usually have different biological activity and it is imperative to synthesise an optically pure compound. Phosphonates have their applications as herbicides (i.e. Roundup), antivirals, antibiotics (i.e. fosfomycin) or chelating agents. *Rhodotorula mucilaginosa* is a known biocatalyst and was chosen for this experiment as it is able to grow in in the presence of phosphonate, as well as keeps its reductive properties in anhydrous conditions – here in hexane.

Immobilised on Celite R 630 and lyophilised cells of *Rhodotorula mucilaginosa* were the catalyst in biotransformation of 1,1-difluoro-2-oxo-phenylethylphosphonate diethyl into 1,1-difluoro-2-hydroxy-phenylethylphosphonate diethyl. Substrate, immobilised cells, and the addition of ethanol or isopropanol or a mixture of them both, in anhydrous hexane were shaken on a rotary shaker 130rpm for 3, 6 and 9 days. After biotransformation the solvent was evaporated on rotary evaporator. Samples for ^{31}P NMR were made with deuterated chloroform. The addition of quinine (a chiral solvating agent) in the samples made it possible to distinguish an optically pure product on ^{31}P NMR, which was the objective of the biotransformation.

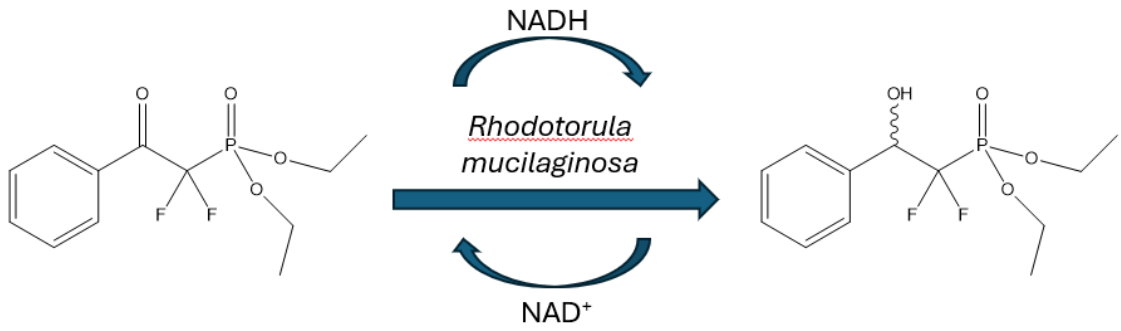

Figure 1. The process of biotransformation of the substrate into the product by *Rhodotorula mucilaginosa*