Interference of glycolysis metabolite acetaldehyde with xenobiotics in whole-cell biotransformations with *Saccharomyces cerevisiae*

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The stereoselective whole-cell biotransformation of the non-natural substrate ethyl acetoacetate yields ethyl (*S*)-3-hydroxybutyrate in up to 65% with 97% enantiomeric excess. However, up to 32% of the starting material are subject to cell stress reactions of the cells. These include ester hydrolysis and *retro*-Claisen condensation. The latter reaction has not been described for living cells, yet, and it may greatly impinge on the metabolic fate of electron deficient substrates.

Apart from that acetaldehyde, a metabolite from glycolytic degradation of hexose sugars (here: glucose), contributes to undesired by-product formation. We found that the outcome of the microbial reduction of ethyl acetoacetate with *Saccharomyces cerevisiae* depends on oxygen partial pressure and glucose concentration. With optimal oxygen supply and glucose concentration 5 mmol/L the keto function is being reduced to the chiral alcohol. Factors which favour formation of acetaldehyde, like low oxygen partial pressure or high glucose levels induce formation of carboligation products.

The interference of the substrate with the reducing enzyme alcohol dehydrogenase and its substrate acetaldehyde consequently affect glycolysis in whole-cell biotransformations of xenobiotics.

References

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