Sustainable production of nucleoside analogues by a high-efficient purine 2'- deoxyribosyltransferase immobilized onto Ni2+ chelate magnetic microparticles

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Abstract

The present work aims to develop a magnetic biocatalyst for customized production of nucleoside analogues using mutant His-tagged purine 2'-deoxyribosyltransferase from Trypanosoma brucei (TbPDTV11S) immobilized onto Ni2+ chelate magnetic iron oxide porous microparticles (MTbPDTV11S). Biochemical characterization revealed MTbPDTV11S5 as optimal candidate for further studies (10,552 IU g−1; retained activity 54% at 50 °C and pH 6.5). Interestingly, MTbPDTV11S5 displayed the highest activity value described up to date for an immobilized NDT. Moreover, MTbPDTV11S5 was successfully employed in the one-pot, one-step production of different therapeutic nucleoside analogues, such as cladribine or 2'-deoxy-2-fluoroadenosine, among others. Finally, MTbPDTV11S5 proved to be stable when stored at 50 °C for 8 h and pH 6.0 and reusable up to 10 times without negligible loss of activity in the enzymatic production of the antitumor prodrug 2'-deoxy-2-fluoroadenosine.

Keywords:

Enzyme immobilization, Bioprocesses, Nucleoside analogues, 2'-Deoxyribosyltransferases