Synthesis of β-amino acids using a modified Hydantoinase Process as an enzymatic reaction cascade

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The use of β-amino acids is of increasing importance in the pharmaceutical industry. They serve for instance as building blocks for β-peptides, which form very stable secondary structures and are therefore promising molecules for the application as peptidomimetics.11 Due to their specific structure, β-amino acids are also found as constituents of biologically active secondary metabolites like the antitumor drug Taxol™, which contains a modified β-phenylalanine moiety (Fig. 1).22 Since the Hydantoinase Process for the synthesis of optically pure α-β-amino acids from hydantoin derivatives is well-established in industry, a modified Hydantoinase Process for the synthesis of β-amino acids has been proposed (Fig. 2).33

Fig. 1: Structure of α-amino acids, β-amino acids and Taxol™

Fig. 2: Modified Hydantoinase Process for the synthesis of β-amino acids.

dynamic kinetic resolution

- enzymatically by racemase, theoretically:
  ✓ 100 % yield
  ✓ 100 % enantiomeric excess
  ✓ no enantiomeric separation necessary

outlook

- hydrolysis of D,L-carbamoyl-β-amino acids
- purification and characterization of enzymes involved in the cascade
- applications in microfluidic systems (continuous system with lower product inhibition)
- investigations toward reaction cascades with isolated enzymes in organic solvents