The enantioselective reduction of carbonyl groups is of interest for the production of various chiral compounds such as hydroxy acids, amino acids, hydroxy esters, or alcohols. Such products have high economic value and are most interesting as additives for food and feed or as building blocks for organic synthesis. Enzymatic reactions or biotransformations with whole cells (growing or resting) for this purpose are described. Although conversions with whole cells are advantageous with respect to saving expensive isolation of the desired enzymes, the products often lack high enantiomeric excess and the process results in low time-space-yield. For the synthesis of chiral alcohols, only lab-scale syntheses with commercially available alcohol dehydrogenases have been described yet. However, most of these enzymes are of limited use for technical applications because they lack substrate specificity, stability (yeast ADH) or enantioselectivity (Thermoanaerobium brockii ADH). Furthermore, all enzymes so far described are forming (S)-alcohols. Quite recently, we found and characterized several new bacterial alcohol dehydrogenases, which are suited for the preparation of chiral alcohols as well as for hydroxy esters in technical scale. Remarkably, of all these novel ADHs the (R)-specific enzymes were found in strains of the genus Lactobacillus. Meanwhile, these new enzymes were characterized extensively. Protein data (amino acid sequence, bound cations) confirm...
that these catalysts are novel enzymes. (R)-specific as well as (S)-specific ADHs accept a broad variety of ketones and ketoesters as substrates. The applicability of alcohol dehydrogenases for chiral syntheses as an example for the technical use of coenzyme-dependent enzymes is demonstrated and discussed in this contribution. In particular NAD-dependent enzymes coupled with the coenzyme regeneration by formate dehydrogenase proved to be economically feasible for the production of fine chemicals.

**Abbreviations**

ADH = alcohol dehydrogenase  
YADH = yeast alcohol dehydrogenase  
HLADH = horse liver alcohol dehydrogenase  
TBADH = *Thermoanaerobium brockii* alcohol dehydrogenase  
FDH = formate dehydrogenase