# Abstract

The research described in this thesis is concerned with the synthesis and stereoselective transformations of 4,5-dihydro-3(2H)-furanones and their 3-hydroxy derivatives. In Chapter 1, a review of synthetic routes to 3-hydroxytetrahydrofurans is presented. This incorporates the wide range of applications for these types of compounds.

Preparative routes to and stereoselective transformations of the furanones investigated in this study are discussed in Chapter 2. The bulk of the work centers on stereoselective carbonyl group reductions to generate the 3-hydroxytetrahydrofuran derivatives in racemic form followed by kinetic resolution *via* lipase mediated esterification, resulting in enantioenriched 3-acetoxy and 3-hydroxytetrahydrofuran derivatives. In many cases, these processes proceed in a highly enantioselective manner. The influence of the lipase species and concentration of enzyme employed on the yield and stereochemical outcome of the reactions is examined in detail. Access to the complementary series of furanone and hydroxytetrahydrofuran derivatives by oxidation or reduction of the enantioenriched compounds was achieved through conventional synthetic methods. Chapter 2 also contains details of a novel synthetic route to a range of 2,3,5-trisubstituted furans from α-hydroxyenones and 4,5-dihydro-3(2H)-furanones. The mechanistic rationale for these transformations and the migratory aptitude of alkyl groups towards the formation of these furans is discussed in detail. Finally, Chapter 2 outlines the synthesis of a series of diarylcyclopentenones that were synthesised as part of our investigations.

Chapter 3 contains a description of the synthetic procedures and biotransformations carried out together with key analytical and spectroscopic properties of the compounds studied and where appropriate, their analysis using chiral HPLC analysis.