Abstract

Muscarine was identified as an active principle of the poisonous mushroom Amanita muscaria over 170 years ago and has been identified as an agonist of acetylcholine. The synthesis of all stereoisomers of muscarine have been accomplished at this stage by chemical methods and the biological activity of these compounds tested. A number of synthetic routes to enantiomerically pure muscarine and its analogues have been published. In this work, we are focussed on the use of a novel biotransformation strategy to access these compounds. Asymmetric synthesis involves targeting a synthetic pathway leading to one enantiomer of a compound and biocatalysis is one strategy used in asymmetric synthesis.

Chapter 1 consists of a review of the relevant literature pertaining to the synthesis and stereoselective transformations of 3-hydroxytetrahydrofuranss. A review of synthetic routes to these compounds is presented, with a particular focus on routes to the natural product muscarine and its analogues.

Chapter 2 discusses the preparative routes to the 3-hydroxytetrahydrofurans *via* 3(*2H*)-furanones. Steps amongst which include Rh(II) mediate cyclisation and kinetic resolution *via* baker's yeast mediated carbonyl reduction, resulting in enantioenriched 3-hydroxytetrahydrofuran derivatives. Finally, application of this methodology to the preparation of all four enantiomers of an analogue of desmethylmuscarine and the synthesis of epimuscarine is described.

Chapter 3 consists of a detailed experimental section outlining the synthetic procedures employed