ABSTRACT

The thesis entitled “Stereoselective total synthesis of $\gamma$-butyrolactone natural products and (3R,4S)-isostreptenol III” is presenting the first stereoselective total synthesis of natural products (−)-Inohanalactone, (+)-Pseudonocardide A, (+)-Pseudonocardide C and 3-"epi-ent"-Pseudonocardide D from starting materials D-ribose. This thesis includes the first stereoselective total synthesis and structure revision of reported (3R,4S)-isostreptenol III.

Chapter 1 describes the first stereoselective total synthesis of (−)-Inohanalactone. The salient features of this synthesis are highly Z-selective Wittig olefination and chemoselective oxidation of 1,4-diol to the $\gamma$-butyrolactone. The synthesis was accomplished from readily available 2,3-O-isopropylidene-L-erythrose derived from D-ribose in eight steps with 32% overall yield.

Chapter 2 describes the divergent chiron approach for the first total synthesis of (+)-pseudonocardide A, (+)-pseudonocardide C and epimer of "ent"-pseudonocardide D starting from D-ribose. The significant aspects of these syntheses are highly Z-selective Wittig olefination, one pot formation of $\gamma$-butyrolactone and $\gamma$-butenolides [1,4] O-to-O silyl migration followed by lactonization and intramolecular oxa-Michael reaction.

Chapter 3 describes the first total synthesis and structure revision of (3R,4S)-isostreptenol III. The structure of isolated 3R,4S-isostreptenol III was revised to 3R,4R-isostreptenol III. The salient features of this synthesis are stereoselective installation of hydroxymethyl group, highly diastereoselective Wittig olefination and regioselective epoxide opening. The synthesis was accomplished from a common intermediate readily prepared from D-ribose.