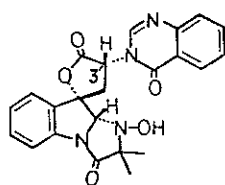


Total Synthesis of (+)- and (-)-Tryptoquivaline G and L
by Biomimetic Double Cyclization

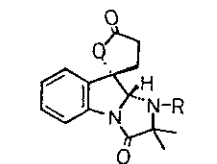
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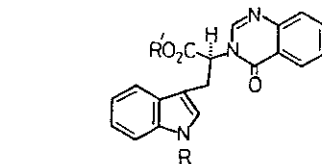
A facile biogenetic type total synthesis of (+)- and (-)-tryptoquivaline G and L by oxidative double cyclization of N-acyltryptophan derivative **5c** was achieved. The model study was carried out by the reaction of benzyl 3-indole propionate with N-methoxycarbonyl- (**2a**) or N-trichloroethoxycarbonyl- (**2b**) methylalanine p-nitrophenyl esters (KF-18-crown-6, EtN(i-Pr)₂, MeCN) followed by hydrogenolysis to give the corresponding N-acylated derivatives **3a** and **3b**, respectively. Bromination of **3a** with NBS in CH₂Cl₂-CF₃CO₂H (10 : 1) gave **4a** and its cis configuration was established by x-ray analysis. The similar NBS reaction of **3b** gave **4b** which was converted to **4c** by treatment with AcOH-Zn. The reaction of L-tryptophan benzyl ester with isatoic anhydride followed by treatment with (EtO)₃CH-TsOH provided **5a**. Condensation of **5a** with **2b** (KF-18-crown-6-MeCN) gave **5b** which was debenzylated to give **5c**. Bromination of **5c** with NBS in boiling CF₃CO₂H gave **6** and **7** which were converted to **8** and **9** (AcOH-Zn). Oxidation of **8** with m-CPBA in CH₂Cl₂ afforded (-)-tryptoquivaline L **10**. Epimerization of **10** with t-BuLi-AcOH, -70°C provided (+)-tryptoquivaline G **1**, whereas similar oxidation of **9** gave (-)-tryptoquivaline G **1**. On the other hand, analogous series of reactions starting from D-tryptophan provided (+)-**1** via 3'-epimer of **8** and (+)-tryptoquivaline L by oxidation of 3'-epimer of **9**.



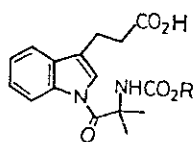
1 (+)-Tryptoquivaline G



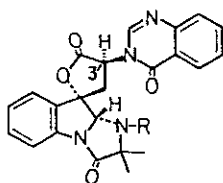
4 a, R = CO₂CH₃
b, R = CO₂CH₂CCl₃
c, R = H



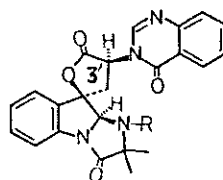
5 a, R = H, R' = Bzl
b, R = COC(CH₃)₂NHCO₂CH₂CCl₃, R' = Bzl
c, R = COC(CH₃)₂NHCO₂CH₂CCl₃, R' = H



3 a, R = CH₃
b, R = CH₂CCl₃



6, R = CO₂CH₂CCl₃
8, R = H
10, R = OH (-)-Tryptoquivaline L



7, R = CO₂CH₂CCl₃
9, R = H
1, R = OH (-)-Tryptoquivaline G