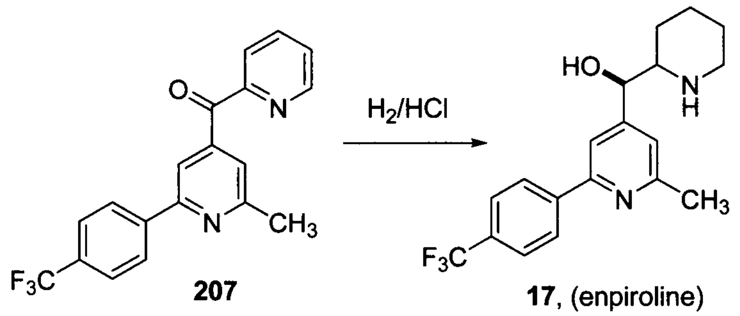
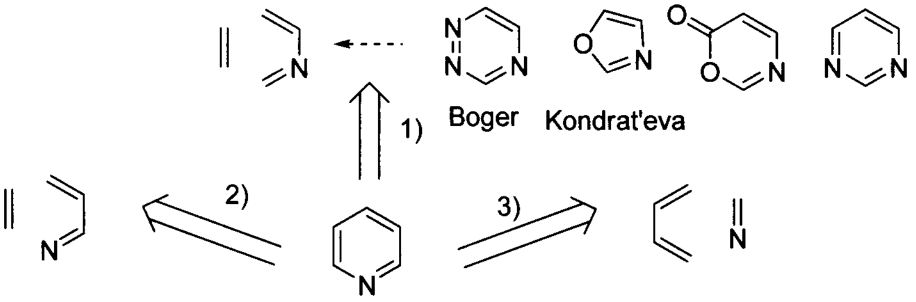


207 **17**, (enpiroline)

10.3.2 Synthesis via Cycloaddition Reactions

[4 + 2]-Cycloaddition reactions

Pyridines can be achieved by the [4 + 2] hetero Diels–Alder cycloaddition of i) an alkene dienophile and an 3-azadiene such as 1,2,4-triazine (the Boger reaction), oxazole (Kondrat'eva pyridine synthesis), oxazinone, pyrimidine, or ii) an alkene and a 4-azadiene; or iii) a butadiene and an azadienophile.



1,2,4-Triazine as the azadiene (Boger reaction)

The Boger pyridine synthesis[142] involves an inverse-electron demand[143] hetero-Diels–Alder [4 + 2] reaction of the electron-deficient 1,2,4-triazine **208** with an electron-rich dienophile such as enamine **209** followed by a facile retro-Diels–Alder of the unstable intermediate bicyclic species **210** to liberate nitrogen gas and aromatization via loss of pyrrolidine to afford the appropriately substituted pyridine derivative **211**. The pyrrolidine enamine **209** can be generated *in situ* from the corresponding ketone with pyrrolidine. There is a strong preference for the nucleophilic carbon of the dienophile to add to C-3 of the triazine.