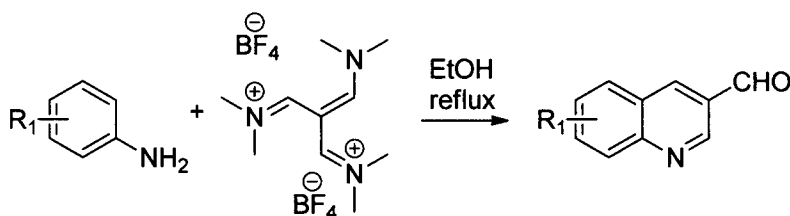


An unconventional modification of the Combes reaction was also used to access pharmacological interesting 3-formyl quinolines by treating anilines with vinamidium salts.<sup>64</sup>



### 11.3.3 Conrad-Limpach<sup>65</sup> and Knorr<sup>66</sup> Reaction

Primary arylamines and  $\beta$ -ketoesters react in the presence of strong acid to provide 2-quinolones (Knorr reaction), whereas their thermal reaction yields 4-quinolones (Conrad-Limpach reaction). These reactions present a typical example of kinetic versus thermodynamic control, which has been employed in the synthesis of many quinolone derivatives for more than a century.

