Abstract

The imidazole ring is a key structural motif of many organic compounds that are fundamental to life, such as histidine, histamine, or (in condensed form) guanine or adenine. The unique properties of this heterocycle in terms of biological activity have resulted in a significant increase in the importance of imidazole derivatives, which since the mid-20th century have been increasingly explored and utilised, among others, as pharmaceuticals and agrochemicals. The significant group of bioactive imidazole derivatives also includes more complex compounds of natural origin, for instance alkaloids. This group includes the so-called lepidilines – imidazolium salts, recognised as essentially bioactive compounds, characterised, among other things, by high cytotoxicity towards selected cancer cells.

One of the most effective methods of modulating the biological properties of organic compounds is the introduction of fluorinated substituents, such as single fluorine atoms, fluoroalkyl, fluoroalkoxy or fluoroalkylthio groups. In this context, two basic synthetic strategies are possible: (i) the use of fluorinated building blocks to obtain target products with already introduced fluorinated substituents, or (ii) direct functionalisation of a non-fluorinated precursor of the target compound.

Through the research planned as part of this dissertation, I decided to address this need and develop a new method for obtaining trifluoromethylthiolated imidazole derivatives. With the above-mentioned alkaloids in consideration, the research was focused on obtaining a series of non-ionic and ionic derivatives bio-inspired by lepidilines. An additional task carried out as part of this doctoral thesis, and at the same time an extension of the topic focused on the synthesis of fluorinated imidazole derivatives, was to study the reactivity of *N*-mono- and *N*,*N'*-disubstituted imidazole-2-thione structural analogues of lepidilines towards *in situ* generated trifluoromethylated nitrilimines, important building blocks in the synthesis of bioactive fluorinated heterocycles.