

Master 2 Internship proposal Academic Year 2023-2024

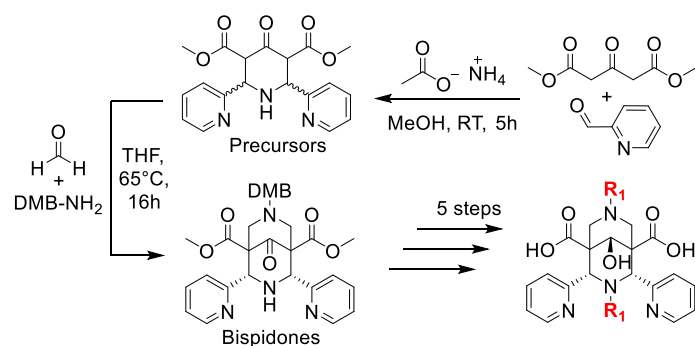
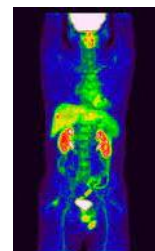
Equipe de Synthèse pour l'Analyse (SynPA)

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<http://www.iphc.cnrs.fr/-Synthese-Pour-l-Analyse-SynPA-.html>
Synthesis of bispidine ligands for radionuclide complexation in the context of nuclear imaging

Nuclear imaging relies on the use of radiotracers for highly sensitive *in vivo* scans. Emerging radionuclides such as ^{89}Zr and $^{149/152/155/161}\text{Tb}$, known for their unique half-lives and emissions, have opened the door to targeted immunoimaging and radiotherapy. The chelation of these metallic isotopes requires the synthesis of new ligands with rapid complexation kinetics in diluted conditions to achieve complexes with strong kinetic stability, making them ideal for *in vivo* applications. Bispidine ligands (bispidine = 3,7-diazabicyclo[3.3.1]nonane) feature a unique rigid and pre-organized structure, which has demonstrated unprecedented stability in complexes with ions such as Mn(II), Cu(II) and Ga(III).

Within this internship, the intern will be in charge of new the multi-step synthesis of bispidine-type ligands for the complexation of ions with higher oxidation states such as lanthanide(III) and Zr(IV), as well as of the synthesis and characterization of the metal complexes.


 Bispidine ligands with various R_1/R_2 coordinating moieties


Positron Emission Tomography image

References: Ndiaye, D. et al, *Angew. Int. Ed.*, **2020**, *13*, 11958. Gillet et al, *Inorg. Chem.*, **2017**, *56*, 11738. Price, T. W. et al, *Chem. Eur. J.*, **2020**, *18*, 7602. Patent WO2023126336A1 and Patent application EP23306128.2.

Keywords: coordination chemistry, chelators, hydroxamate, bispidine, radiotracer

Required skills and qualities: Multi-step organic synthesis, standard characterization techniques (NMR, IR, mass spectrometry); Skills and a taste for coordination and physical chemistry; bibliographical research tools; English; Energy, rigour, method and tenacity.

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