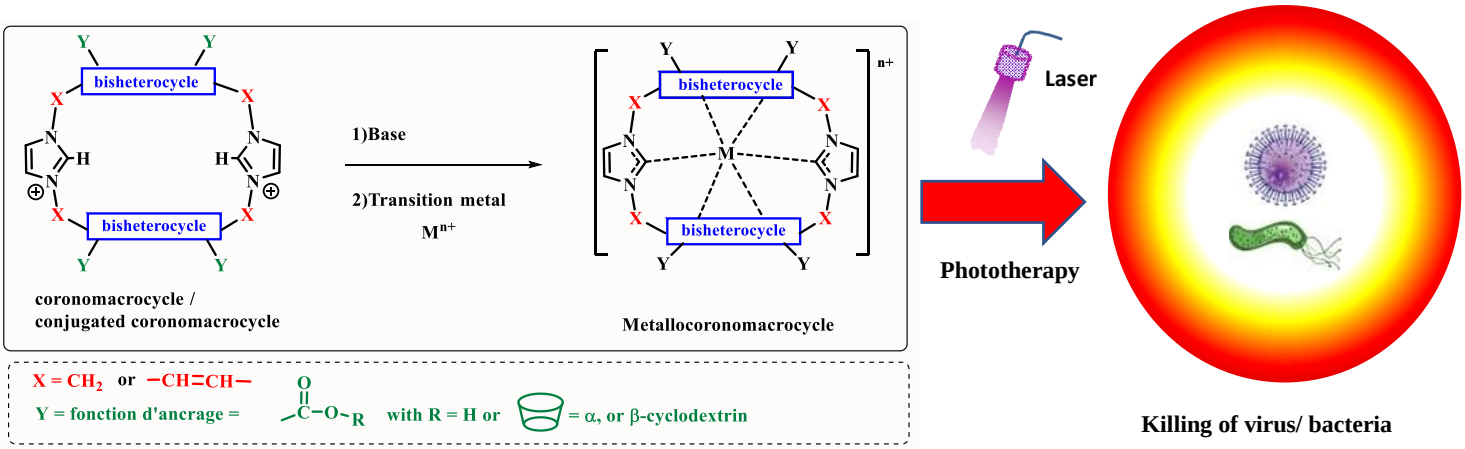
Master 2 level traineeship proposal

Evaluation of the anti-infectious properties of supramolecular photosensitizers with a macro-*bis*-heterocyclic *bis*-imidazolium structure.

Period of the traineeship: January-July 2022
Laboratory: *Laboratoire Lorrain de Chimie Moléculaire* (**L2CM)**, Nancy, France

Background: The development of photoactive molecular systems, with application in phototherapy, opens the way to the treatment of many pathologies, including those of infectious and cancerous origin, using light. Recent work carried out in the laboratory concerning the preparation of potential macro-bis-heterocycles bis-imidazolium ligands NHC (N-heterocyclic carbene) in coordination with transition metals (e.g. Zn (II), Ag (I), Au (III), Pt (II), Fe (II)), has shown interesting intrinsic photophysical and biological properties of these molecules. These observations concern particularly the **production of singlet oxygen ($^1O_2$),** the yield of which can reach 84% for some of the macrocycles obtained, as well as the **antibacterial activities**. We wish to continue the biological characterization of these structures in order to improve their photoactive properties, in particular for applications in **phototherapy (PT).**



Objectives: The objective of the traineeship will concern the **biological characterization** of the original N-macro-bis-heterocyclic carbene ligands and the metal cation complexes of isolated compounds (illustrated above). The focus will be on evaluating the anti-infectious properties of the molecules, in presence or absence of irradiation.

Methodology: The candidate will carry out the evaluation of the **antibacterial** (pathogenic strains, microbiota strains) and **antiviral** (coronavirus, herpesvirus) properties of the compounds, as well as the evaluation of their impact on the **host cells** (cytotoxicity, hematotoxicity). The link with photo-physical (fluorescence, $^1O_2$, photoacoustic), physico-chemical and structure-activity relationships will then be discussed in collaboration with Dr. Florence Dumarçay.

Profile of the candidate: The candidate should have solid knowledge in bacteriology / virology and cell culture. He must have the necessary knowledge for analyzes in **cell biology** (light microscopy, immunofluorescence, FACS, Western blot), **molecular biology** (PCR, RT-PCR) and biochemistry. Good knowledge in chemistry / physical-chemistry will be welcome. For international applicants, fluency in English is sufficient (a good foundation in French will be appreciated).

Application: Applications should be sent to Mihayl Varbanov (mihayl.varbanov@univ-lorraine.fr) and must include a CV and the transcript of records of BSc and MSc levels.