PostDoc offer

Host institution
Name: Institut Galien Paris-Saclay, UMR CNRS 8612
Address: Bâtiment Henri Moissan,
17 avenue desSciences,
91400 Orsay, France
Hosting team
Name: MULTIPHASE
Principal investigator: Dr. Ali MAKKY
Internship details
Duration: 18 months
Period: October 2025

Synthesis of smart porphyrin-based conjugates to design light-responsive nanoassemblies with tunable photothermal/photodynamic activities against resistant bacterial infection

Context

Photothermal therapy (PTT) and **photodynamic therapy (PDT)** that rely on the generation of heat and reactive oxygen species upon the illumination of photoactive materials have emerged as promising antimicrobial approach for localized resistant bacterial infections. Since many years, our team is developing light-responsive nanomaterials based on the assemblies of Lipid-Porphyrin conjugates to combat either local resistance bacterial infections or solid tumors.[1-3] These assemblies showed good therapeutic outcomes, however there are still some room of improvement mainly by reducing their photothermal effect compared to their photodynamic efficiency.[4, 5] Therefore, the aim of this project is to develop breakthrough assemblies based on the synthesis of smart porphyrin-lipid conjugates thus enabling bimodal and tunable PTT/PDT to combat efficicently resistant bacteria and biofilm related infections without the need of antibiotics. This postdoc offer is part of the PHORTUNA project of **PEPR LUMA research programme (light-matter interactions)** and was supported by the French National Research Agency, as a part of the France 2030 program, under grant ANR-24-EXLU-0011.

Tasks

- Synthesis of new conjugates and their chemical characterization (NMR, Mass spectrometry)
- Preparation of their supramolecular assemblies and characterization by DLS, TEM, absorbance, fluorescence, stability, etc…
- Evaluation of their photothermal/photodynamic efficicencies against plactonic bacteria and biofilm

Candidate profile

We are seeking a full-time Postdoctoral Research Fellow to join a multidisciplinary research team focused on the desin of light-responsive supramolecular assemblies to combat resistant bacterial infections and biofilm. The candidate should have a PhD in organic chemistry with solid experience in the synthesis of porphyrin derivatives, modified lipids, porphyrin-lipid conjugates or similar conjugates. The position is expected to start on October 1, 2025, as a 18 months full-time appointment, with the possibility to be renewed for additional 1 year based on the performance and results obtained by the candidate.

Contact

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Interested candidates should send a cover letter, CV and contact information for two references to the main investigator: Dr. Ali Makky: ali.makky@universite-paris-saclay.fr

References

1. L.-G. Bronstein, P. Cressey, W. Abuillan, O. Konovalov, M. Jankowski, V. Rosilio and A. Makky, *J. Colloid Interface Sci.*, 2022, **611**, 441-450.
2. L.-G. Bronstein, Á. Tóth, P. Cressey, V. Rosilio, F. Di Meo and A. Makky, *Nanoscale*, 2022, **14**, 7387-7407.
3. J. Alhoussein, K. Merabishvili, T. Ho, A. Elkihel, P. Cressey, Á. Tóth, A. Qian, M. Hery, J. Vergnaud, S. Domenichini, F. Di Meo, J. Chen, G. Zheng and A. Makky, *Journal of Controlled Release*, 2025, **381**, 113621.
4. P. Cressey, L.-G. Bronstein, R. Benmahmoudi, V. Rosilio, C. Regeard and A. Makky, *International Journal of Pharmaceutics*, 2022, **623**, 121915.
5. T. Ho, K. Guidolin, A. Makky, M. Valic, L. Ding, J. Bu, M. Zheng, M. H. Y. Cheng, J. Yau, J. Chen and G. Zheng, *Angewandte Chemie International Edition*, 2023, **62**, e202218218.

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