

Development of Novel Luminescent Metal-Based Imaging Agents for Infectious Disease Diagnostics

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REPORT INFO

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Host laboratory in region Centre-Val de Loire: CNRS / Université d'Orléans

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ABSTRACT

This report summarizes work conducted during a six-month sabbatical completed in two three-month periods during Summer 2023 and Summer 2024 as a guest fellow at Le Studium in Orléans, France. The fellowship supported an established international collaboration focused on the development of luminescent metal-based imaging agents for infectious disease diagnostics. The primary emphasis was on fungal and mycobacterial infections, where delays in diagnosis are associated with significant morbidity and mortality. The fellow contributed clinical infectious diseases expertise, regulatory perspective, and translational guidance to ensure alignment with potential clinical application. The fellowship enabled continued research progress, international dissemination of results, and strengthening of long-term collaborative partnerships.

1- Introduction

The fellowship addressed ongoing challenges in the diagnosis of infectious diseases through development of innovative luminescent metal-based imaging agents. Building on collaborative work initiated in 2019, this project integrates chemical synthesis with clinical feasibility considerations to support translational research objectives.

2- Experimental details

Research activities were conducted at CNRS and the Université d'Orléans, including collaborative planning, scientific consultation, and review of experimental progress. Laboratory experimentation was performed by collaborators and trainees within the host

institutions, with strategic direction and translational input provided by the fellow.

3- Results and discussion

Progress focused on proof-of-concept validation of antibody-functionalized nanobeads for targeted delivery and imaging of infectious pathogens. Identified technical challenges are actively being addressed by ongoing graduate research within the host laboratories.

In Nguyen et al., we report the design, synthesis, and characterization of water-soluble mixed-ligand metallacrown complexes that exhibit near-infrared (NIR) luminescence with lower-energy excitation requirements. The study demonstrates that strategic ligand

modification enables efficient NIR emission while minimizing photobleaching and biological autofluorescence, two major limitations of conventional fluorescent probes. The authors show that these metallacrowns maintain favorable photophysical properties in aqueous environments, supporting their potential use in biological and medical imaging applications. This work provides an important proof of concept for the development of metal-based luminescent agents with improved excitation efficiency and translational relevance for diagnostic imaging.

4- Conclusion

The Le Studium fellowship supported meaningful advancement of an established international research program and facilitated sustained collaboration between French and U.S. investigators. The work contributes to the longer-term goal of developing clinically relevant diagnostic tools for infectious diseases.

5- Perspectives of future collaborations with the host laboratory

Collaborations will continue through joint supervision of trainees, shared dissemination activities, and development of future externally funded research initiatives.

6- Articles published in the framework of the fellowship

Nguyen TN et al. Chemistry – A European Journal, 2023.

7- Acknowledgements

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8- References

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