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Comparison of the interactions of 18-membered lanthanide macrocycles with G-quadruplexes

ABSTRACT

Cancer remains the second most common cause of death worldwide. New compounds that could be applied in cancer therapy are still sought. One of the approaches proposed in the literature is the selective stabilization of G-quadruplexes (GQs) in particular genome regions of cancer cells. The GQ is a non-canonical four-stranded secondary structure of nucleic acids formed by guanine-rich sequences. Macrocyclic complexes of lanthanides represent an interesting group of compounds specially designed for targeting nucleic acids, yet the influence of subtle diamine scaffold variations on GQ interaction remains insufficiently defined. The presentation will concern the template synthesis, characterisation and comparative evaluation of La³⁺, Dy³⁺ and Pr³⁺ macrocyclic complexes derived from dicarbonyl derivatives of pyridine and aliphatic or alicyclic diamines, focusing on topology-dependent interactions with telomeric GQs (Tel26, Tel22), promoter GQs (Pu22, hTERT) and duplex DNA (a control). The research methodology includes i.a. GQ thermal stability measurements, circular dichroism experiments and fluorimetric titrations. The results highlight unique structure-activity relationships in lanthanide macrocycles and provide a rare complement to prior studies on lanthanide-DNA interactions. Overall, these findings contribute to a comparative framework for understanding how subtle structural modifications in lanthanide macrocycles influence topology-dependent GQ recognition, providing guidance for the rational tuning of future ligand architectures.

Keywords: lanthanide, macrocycle, complex, DNA, G-quadruplex

BIOGRAPHY

I am a second year doctoral candidate at the Faculty of Chemistry, Adam Mickiewicz University in Poznań. My scientific interests focus on the synthesis of macrocyclic complexes and studying their interactions with biomolecules. Apart from chemistry, I am interested in learning foreign languages, especially French. My other hobbies include reading, hiking and baking sweets.