Carbohydrate-functionalised metal complexes: targeting bacterial carbohydrate-binding proteins for therapeutic and sensing applications

K. Wojtczak,[a] J.P. Byrne [a]*

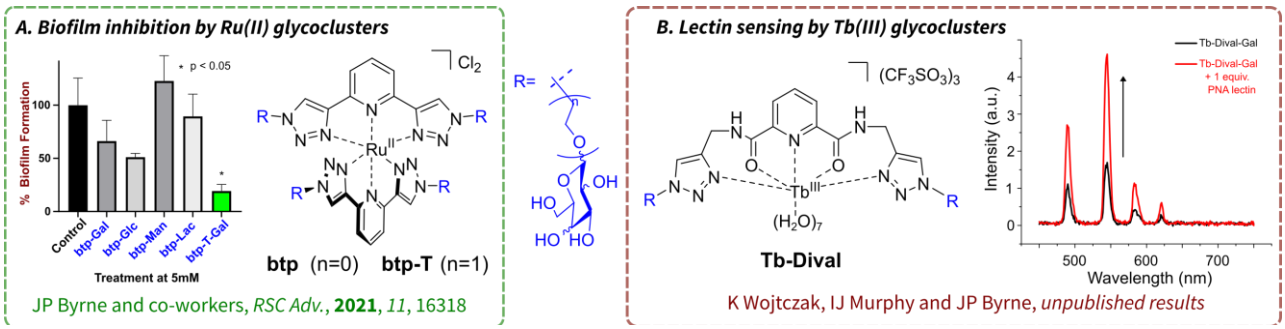
[a] School of Biological and Chemical Sciences, National University of Ireland Galway, Ireland

joseph.byrne@nuigalway.ie

Carbohydrates can confer metal complexes with many properties beneficial for biological inorganic chemistry, including well-defined stereochemistry and water-solubility. Moreover, targeted selective interactions with biomolecules, such as carbohydrate-binding proteins offer potential pathways for therapeutic and diagnostic applications. Carbohydrate–protein interactions are often key to the pathology of bacterial infections,[1] and targeting the carbohydrate-binding proteins (lectins) of *P. aeruginosa* (which are selective for D-galactose and L-fucose) has recently become an area of increasing interest in glycoconjugate chemistry.[2] While various multivalent glyconconjugate design approaches are reported, use of metal coordination chemistry in design of compounds targeting these lectins is under-exploited. Carbohydrate-functionalised metal complexes allow for properties of both carbohydrate and metal ions to be exploited to address healthcare challenges.

Here, we report synthesis of a series of Ru(II)-centred glycoclusters, presenting four carbohydrate units in a three-dimensional way in order to target bacterial lectins, Fig. 1A.[3] The ability of these complexes to inhibit biofilm formation by *P. aeruginosa* was assessed and found to be dependent on the identity and presentation of the carbohydrate motif. Building on this work, we have also designed novel luminescent lanthanide(III)-centred glycoclusters, Fig. 1B, aiming to detect lectins associated with pathogenic bacteria such as *P. aeruginosa*, for diagnostic applications. These luminescent systems show 'switch-on' sensing behaviour in the presence of several lectins, with the selectivity of the lectin for different carbohydrate structures determining the response. Studies are ongoing with other lectins of different selectivities to establish the scope of this sensing paradigm.

Figure 1. Two classes of carbohydrate-functionalised metal complexes designed for interactions with lectins.



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