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Merging anticancer metallodrugs and phototherapy: Light activation of ruthenium-based anticancer prodrugs

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This lecture will build a bridge between cisplatin-like therapies and photodynamic therapy by addressing the light activation of anticancer metallodrugs. A rather vast family of new compounds, based notably on ruthenium(II), change their chemical structure upon visible light irradiation. It is possible to use these structural changes to trigger toxicity, i.e., achieving minimal toxicity in the dark but maximal toxicity after light irradiation. In the dark a sulfur- or nitrogen-based ligand serves as a protecting group that prevents the metal compound interacting with biological ligands. Once irradiated, the protecting ligand is substituted by water and the metal compound becomes able to bind to biological ligands such as DNA, small molecules, or proteins, and kill cancer cell. The author will show how the protecting ligand can also be used to link the metal-based prodrugs to a targeting vector such as a liposome, from which the metal-based prodrug detaches upon light activation. Supported and non-supported light-activatable metallodrugs remain activatable even in absence of dioxygen, which differentiates them from conventional dyes used in photodynamic therapy. Finally, different strategies will be addressed that allow for tuning the light absorption properties of metal-based compounds and bring them into the photodynamic window.

Biography

Sylvestre Bonnet obtained his PhD in Inorganic Photochemistry in 2005 in Strasbourg, France. After moving to The Netherlands as a Postdoctoral Fellow he obtained a NWO-Veni grant in 2008 at Utrecht University, and a Tenure Track position at Leiden University in 2009. He recently obtained a NWO-Vidi grant (2012) and an ERC Starting Grant (2013) to build his inorganic chemical biology research group in Leiden. His expertise lies at the crossing point between inorganic chemistry, photochemistry, and lipid bilayers, with a strong focus on anticancer research and light-activated anticancer metallorugs. He has authored more than 35 peer-reviewed reports.

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