Trans-ruthenium(II) complexes for photoactivated cChemotherapy: from design to anticancer activity

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Propositions

Accompanying the Thesis

Trans-Ruthenium(II) Complexes for Photoactivated Chemotherapy – From Design to Anticancer Activity

1. The discovery of wavelength-dependent photosubstitution reactions in ruthenium(II) complexes opens new possibilities for the design of photoactivated therapeutics. *This Thesis, Chapters 3, 4 and 5.*

2. Trans effects in the excited triplet states of ruthenium(II) complexes are not merely theoretical curiosities but decisive factors governing the wavelength dependence of photosubstitution reactions. *This Thesis, Chapters 3 and 6.*

3. Dual-targeting photoactivated chemotherapy represents a fundamental paradigm shift in phototherapy in which temporal control becomes as important as spatial control and molecular selectivity. *This Thesis, Chapters 4 and 5.*

4. Synergistic drug combinations are essential for overcoming biological redundancy and resistance mechanisms in cancer therapy. *D. Plana et al., Cancer Discov. 2022, 12 (3), 606-624. This Thesis, Chapters 1, 4 and 5.*

5. In inorganic medicinal chemistry, metal centers should not be regarded solely as cytotoxic centers. *R. Lengacher et al., Chem. Soc. Rev. 2022, 51, 7715-7731.*

6. Without standardized experimental protocols and reporting guidelines, quantitative comparison of photochemical and photobiological properties of published phototherapeutic compounds remains unreliable. *M. Maafi, Photochem. 2024, 4(2), 233-270.*

7. The observation of anti-kasha behavior in ruthenium(II)-based photosubstitution reactions challenges conventional assumptions about excited-state reactivity and suggests that revision of current mechanistic models is needed. *D. Belleto et al., Daltron Trans. 2024, 53, 8243; B. Pfund & O.S. Wenger, J. Am. Chem. Soc. 2025, 147(30), 26477-26485.*

8. The clinical success of anticancer phototherapy not only depends on the photochemical and biological properties of the prodrug and its photoproducts, but also on the context of disease. *S. Monro et al., Chemical Reviews 2019, 199 (2), 797-828*

9. Research demands perseverance, yet meaningful breakthroughs often arise from reconsidering classical approaches with a fresh perspective to tackle a scientific problem.

10. The ability to efficiently conduct scientific research does not only rely on individual scientists, but also on a laboratory environment being well-organized, communicative, and collaborative.

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