Fine-tuning the cytotoxicity of ruthenium(II) arene compounds to enhance selectivity against breast cancers

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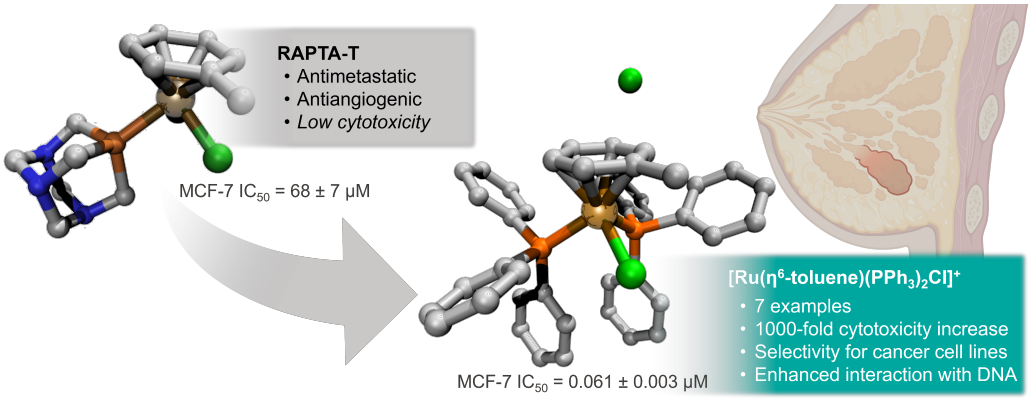
Ru(η^6-arene)(PTA)Cl$_2$ (PTA = 1,3,5-triaza-7-phosphaadamantane), or RAPTA, complexes have arisen (together with other ruthenium compounds) as alternatives to platinum-based drugs in cancer therapy [1]. RAPTA compounds exhibit reduced general toxicity [2] and have demonstrated efficacy against breast cancer by suppressing metastasis [3], tumorigenicity [4], and inhibiting the replication of the human tumour suppressor gene BRCA1 [5]. However, their limited cytotoxicity, and therefore comparatively high dosing, has hindered their translation to the clinic.

We synthesised and explored the activity of a series of RAPTA-like ruthenium(II) arene compounds against two breast cancer cell lines and identified [Ru(η^6-toluene)(PPh$_3$)$_2$Cl]Cl as a potential therapeutical candidate with nearly a 1000-fold increase in cytotoxicity compared to RAPTA-T. The compound was further studied, revealing its remarkable stability and enhanced interaction with the minor and major grooves of DNA.



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