Evaluation of novel ferrocenyl chalcone-phthalocyanine conjugates as phototherapeutic agents

Triple negative breast cancer (TNBC) is a cancer subtype that does not overexpress the female hormones estrogen and progesterone nor the epidermal growth factor HER-2. This minimizes the treatment options given the lack of targeted therapy agents, which result in a worse prognosis along with higher tendency to relapse.[1] Approximately 10-15 % of breast carcinomas are TNBC[2], therefore, there is an urgency to find effective therapeutic agents. Photo dynamic therapy (PDT) is a minimally invasive therapy that uses light to excite a photosensitizer (PS), which in the presence of oxygen, can cause cell death.[3] Many photosensitizer have been studied but phthalocyanines have been found among the most promising.[4] Because the inner-most part of a tumor is hypoxic, drugs that target the outer vasculature are needed for a more effective response. Ferrocenyl chalcones with diverse heterocycles have shown significant anti-cancer activity and although mechanism of action is unclear, anti-angiogenic and vascular disruption have been linked to their activity.[5] Therefore, phthalocyanine-ferrocenyl chalcone conjugates would make ideal photosensitizers for the treatment of cancer. Specifically, cancers such as triple negative breast cancer which do not provide the common treatment targets. The use of a PDT phthalocyanine-ferrocenyl chalcone conjugate could represent a minimally invasive and much more effective treatment against the aggressive subtype of this prevalent disease.

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[1] Dawood, S. *Drugs***2010**, *70*(17), 2247–2258.

[2] Stagg, J.; Allard, B. *Therapeutic Advances in Medical Oncology***2013**, *5*(3), 169–181.

[3] Sibata, C. H.; Colussi, V. C.; Oleinick, N. L.; Kinsella, T. J. *Brazilian Journal of Medical and Biological Research***2000**, *33*(8), 869–880.

[4] Almeida-Marrero, V.; Winckel, E. V. D.; Anaya-Plaza, E.; Torres, T.; Escosura, A. D. L. *Chemical Society Reviews***2018**, *47*(19), 7369–7400.

[5] Sayed, M.; El-Dean, A. M. K.; Ahmed, M.; Hassanien, R. *Journal of Heterocyclic Chemistry***2018**, *55*(5), 1166–1175.