Self-illuminating chemiluminescent photosensitizers for a selective anticancer therapy

Carla M. Magalhães,[1,*] P. Berdullas,[1,2] J. Esteves da Silva,[1,2] L. Pinto da Silva[1,2]

[1]Chemistry Research Unit (CIQUP), Faculty of Sciences of University of Porto, R. Campo Alegre 687, 4169-007 Porto, Portugal.

[2]LACOMEPHI, GreenUPorto, Department of Geosciences, Environment and Territorial Planning, Faculty of Sciences, University of Porto, R. Campo Alegre 697, 4169-007 Porto, Portugal

**up201201533@fc.up.pt*

Cancer is a very challenging disease to treat, both in terms of treatment efficiency and side-effects[1]. To overcome these problems, there have been extensive studies regarding the possibility of improving treatment by employing combination therapy, and by exploring therapeutic modalities with reduced side-effects, such as photodynamic therapy[2]. While photodynamic therapy is known for having significant advantages over conventional cancer therapies, its dependence on light has limited it to treating tumors on or just under the skin or on the outer lining of organs/cavities[3].

Herein, we have developed new photosensitizers capable of intracellular self-activation with potential tumor-selectivity based on chemiluminescent reactions involving only a cancer marker. The photosensitizer is directly chemiexcited to a triplet excited state capable of generating singlet oxygen, without requiring either a light source or any catalyst/co-factor. So, this work had two aims: (i) development of a self-activating photosensitizer which can be used for light-free photodynamic therapy, eliminating light-related restrictions that this therapy currently possesses; (ii) assess their co-treatment potential when combined with reference chemotherapeutic agents[4,5]. Cytotoxicity assays with breast and prostate cell lines involving showed that the novel photosensitizers possess significant toxicity toward tumor cells, while not inducing toxicity toward normal cells. Analysis of co-treatment effects revealed significant improvements for both cell lines, producing better results than just for individual photosensitizers and the reference chemotherapeutic agents[4,5].

Acknowledgments

Projects PTDC/QUI-QFI/2870/2020 and UIDB/00081/2020. C.M. acknowledges FCT for the PhD grant (SFRH/BD/143211/2019).

References

[1] Y. L. and Y. N. Shuncong Wang, Yewei Liu, Yuanbo Feng, Jian Zhang, Johan Swinnen, *Cancers*, **2019**, *11*, 1782.

[2] Dawood, S.; Austin, L.; Cristofanilli, M., Oncology, **2014**, *28*, 1101-1107.

[3] C. M. Magalhães, C. G. Esteves, and L. Pinto, *Chemphyschem*, **2016**, *17*, 2286 – 2294.

[4] Luís Pinto da Silva , Ara Núnez-Montenegro , Carla M. Magalhães , Paulo J.O. Ferreira, Diana Duarte , Patricia Gonzalez-Berdullas, Jose E. Rodríguez-Borges, Nuno Vale, Joaquim C.G. Esteves da Silva , *Eur.J. Med.Chem,* **2019**, *183*, 111683.

[5] Luís Pinto da Silva , Carla M. Magalhães , Ara Núñez-Montenegro , Paulo J.O. Ferreira, Diana Duarte, José E. Rodríguez-Borges, Nuno Vale,Joaquim C.G. Esteves da Silva, *Biomolecules,* **2019***, 9*, 384.