Proceedings International
Platinum Open Access Journal (ISSN 2668-6384)

Proceedings, Abstract
Volume 4, Issue 2, 2022, 10
https://doi.org/10.33263/Proceedings42.010

Synthesis and Characterization of New Thionine Derivative for Application in Photodynamic Therapy †

María Gualdesi [1], Jimena Vara [1], Luciana Pereyra [1], Cecilia Alvarez Igarzabal [2], Cristina Ortiz [1,*]

[1] Departamento de Ciencias Farmacéuticas, Facultad de Ciencias Químicas, Universidad Nacional de Córdoba. UNITEFA-CONICET, Argentina; sgualdesi@unc.edu.ar (M.S.G.); jimenavara@unc.edu.ar (J.V.); lpereyra@unc.edu.ar (L.P.); cortiz@unc.edu.ar (C.S.O.)
[2] Departamento de Química Orgánica, Facultad de Ciencias Químicas, Universidad Nacional de Córdoba. IPQA-CONICET, Argentina; cecilia.alvarez.igarzabal@unc.edu.ar (C.I.A.I).
* Correspondence: cortiz@unc.edu.ar (C.O.);
† Presented at The Sixth International Meeting of Pharmaceutical Sciences (RICiFa), November 10-12, 2021, Córdoba, Argentina

Received: 26.04.2022; Revised: 4.05.2022; Accepted: 6.05.2022; Published: 8.05.2022

Abstract: Photodynamic therapy (PDT) has become a well-studied therapy for oncological and non-oncological diseases. However, the rational design of novel photosensitizers (PS) with desirable features remains a big challenge for the pharmaceutical industry. To optimize the properties of the photosensitizers currently used, a new derivative of thionine was synthesized and characterized. The effect of bromination reactions on the physicochemical properties of the PS, such as chemical ionization constant (pKa), chemical and photochemical stability, aggregation, and quantum yield of $^1O2$ production, was also evaluated. Dibrominated thionine (ThBr2) was obtained by electrophilic aromatic substitution, and it was unequivocally characterized by NMR and other spectroscopic techniques. This novel compound showed high chemical and photochemical stability. It was also observed that bromination decreased the ionization constant and increased the aggregation of this photosensitizer in an aqueous medium. For this reason, the new compound showed a lower quantum yield of singlet oxygen production, despite the expected heavy atom effect. Nevertheless, when photohemolysis assays were run, the dibrominated thionine exhibited greater cell damage after photodynamic treatment. In conclusion, ThBr2 is a good candidate for PDT, although it is necessary to develop a vehiculization system to avoid the aggregation and enhance its efficiency.

Keywords: synthesis; photosensitizer; physicochemical properties; photochemical properties.

Funding

This research was supported by grants from Secretaría de Ciencia y Técnica (SeCyT) 113/2017, Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET) PIP N° 11220150100344CO and Fondo para la Investigación Científica y Tecnológica (FonCyT).

Acknowledgments

JV and LP gratefully acknowledge receipt of a fellowship from CONICET. MSG and CIAI are career members of CONICET.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.