Novel Mono- and Multinuclear Porphyrazine Macrocycles.
Physicochemical Properties and Perspectives as Multimodal Anticancer Agents

Elisa Viola

Porphyrazines, apart from the extensively investigated phthalocyanines (tetrabenzoporphyrazines, Fig. 1A), have received increasing attention over the past decade. A lot of structural modifications are possible, one of which involves the annulated benzene rings of the phthalocyanine being replaced by electron-withdrawing heterocyclic rings containing S or N; this results in macrocycles having a general electron-deficient character (representative examples in Fig. 1B,C) [1]. These novel families of porphyrazines, while approaching in many respects the phthalocyanine framework, have distinct physicochemical behavior with implied differences in solid-state and/or solution, UV-visible and electrochemical properties. In addition, the presence of appropriate N-donor fragments in the periphery of the macrocycle allows the synthesis of multicationic water-soluble species and/or multimetallic macrocyclic systems with very interesting structural and electronic features in terms of applications [2]. In the recent decade, several members of the mentioned series of compounds, mainly carrying centrally Mg^{II}, Zn^{II} or Pd^{II}, have been especially studied as promising species for application in Photodynamic Therapy (PDT), a target widely used anticancer treatment, and in the multimodal anticancer therapy, an attractive field emerging in biomedical science [3].

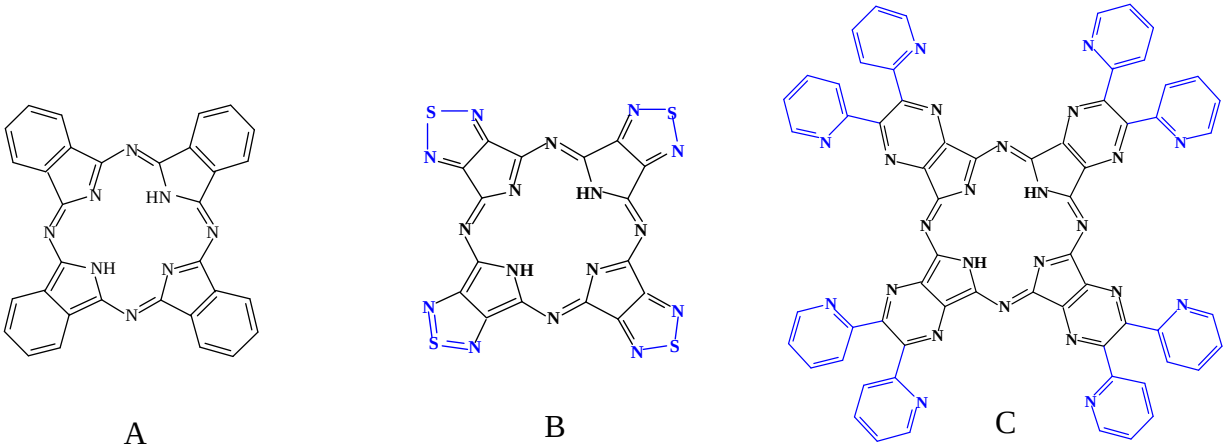

Figure 1. A: phthalocyanine; B: tetrakis(thiadiazole)porphyrazine; C: tetrakis(dipyridinopyrazino)porphyrazine.

References

1. a) Donzello, M. P.; Ercolani, C.; Novakova, V.; Zimcik, P.; Stuzhin, P. A. *Coord. Chem. Rev.*, **2016**, *309*, 107-179; b) Novakova, V.; Donzello, M. P.; Ercolani, C.; Zimcik, P.; Stuzhin, P. A. *Coord. Chem. Rev.*, **2018**, *361*, 1-73 and refs. therein.
2. Donzello, M.P.; Vittori, D.; Viola, E.; Manet, I.; Mannina, L.; Cellai, L.; Monti, S.; Ercolani, C. *Inorg. Chem.*, **2011**, 50, 7391.
3. a) Viola, E.; Donzello, M.P.; Sciscione, F.; Shah, K.; Ercolani, C.; Trigiante, G. *J. Photochem. Photobiol B Biol.*, **2017**, *169*, 101; b) Viola, E.; Donzello, M.P.; Testani, S.; Luccisano, G.; Astolfi, M.L.; Rizzoli, C.; Cong, L.; Mannina, L.; Ercolani, C.; Kadish, K.M. *Inorg. Chem.*, **2019**, *58*, 1120 and refs. therein.