SYNTHESIS OF CATIONIC PORPHYRINS AND THEIR METAL COMPLEXES AS PHOTOSENSITIZING AGENTS FOR APDT

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In recent years the interest in antimicrobial photodynamic therapy (APDT) has increased due to the emergence of antibiotic resistance mechanisms of pathogenic microorganisms. This method is based on the cytotoxic effect of reactive oxygen species (ROS) generated upon excitation of a photoactive substance, a photosensitizer (PS), by the light with definite wavelength. The cationic derivatives of porphyrins are the objects of extensive research for using as photosensitizing agents for APDT. These compounds have positively charged structure which contributes to their active penetration in pathogens due to the non-covalent interactions with negatively charged components of fungi, bacteria cells and viral particles [1].

Therefore, in this work a number of cationic *meso*-arylporphyrins and their complexes with Zn(II) with different numbers of nitrogen-containing heterocyclic groups at the periphery of the porphyrin macrocycle were synthesized as potential PSs for APDT. The synthesis included the condensation of pyrrole with substituted benzaldehydes according to the Lindsey method, the incorporation of the Zn^{2+} cation to obtain metal complexes and the subsequent modification of the terminal regions of the substituents. All the obtained compounds were characterized by UV-spectroscopy, ^{1}H and ^{13}C-NMR spectroscopy, mass-spectrometry.

Photophysical, photochemical and aggregation properties of target cationic derivatives of porphyrins and their complexes with zinc were also studied. The antibacterial activity of the target compounds was investigated against suspensions and biofilms of bacteria *S. aureus* and *E. coli*. *In vitro* experiments have shown that free tetracationic *meso*-arylporphyrins inhibit the growth of gram-positive bacteria in suspension and biofilms without irradiation and with light exposure more strongly than dicationic porphyrins and metal complexes.

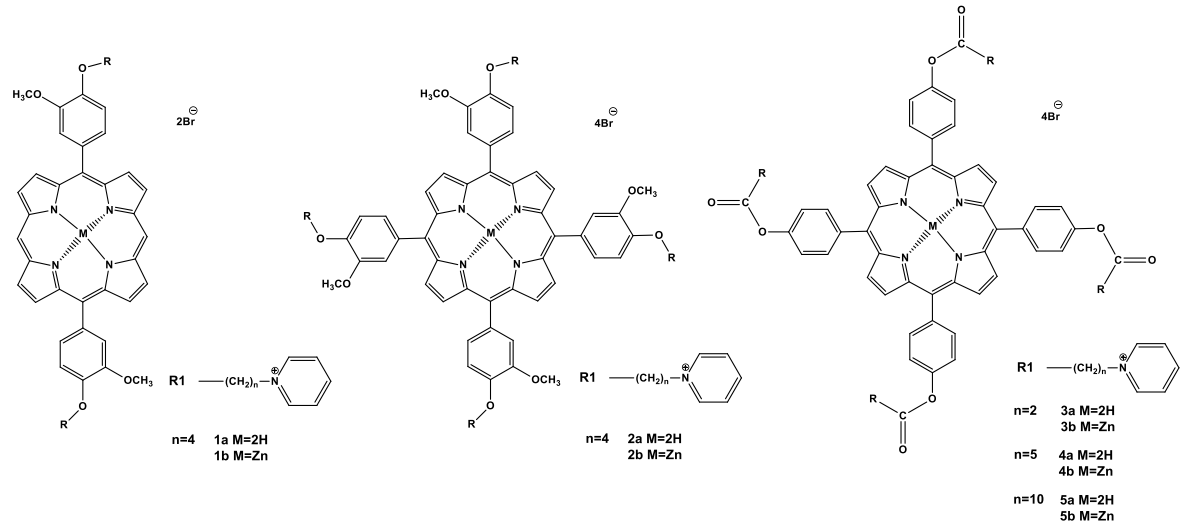

Figure 1. Structure of the compounds obtained

References

1. Branco T. M., Valério N. C., Jesus V. I. R., Dias C. J., Neves M. G. P. M. S., Faustino M. A. F., Almeida A. *Photodiagnosis Photodyn. Ther*. 2018, 21, 285–293.

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