

## Background

- Antimicrobial photodynamic therapy (aPDT) is gaining special importance as an effective approach against multidrug-resistant strains responsible for fatal infections;
- The addition of potassium iodide (KI), a non-toxic salt, is recognized to increase the aPDT efficiency of some photosensitizers (PSs) on a broad-spectrum of microorganisms;
- Until now, the literature survey only reported combinations of PSs and KI with a positive aPDT potentiation. Moreover, the possibility of extending this approach to cationic porphyrins was not evaluated.

## Objectives

The aim of this work was to assess the effect of KI in the presence of a broad range of porphyrinic and non-porphyrinic PSs, in order to gain more comprehensive knowledge about this type of potentiation.

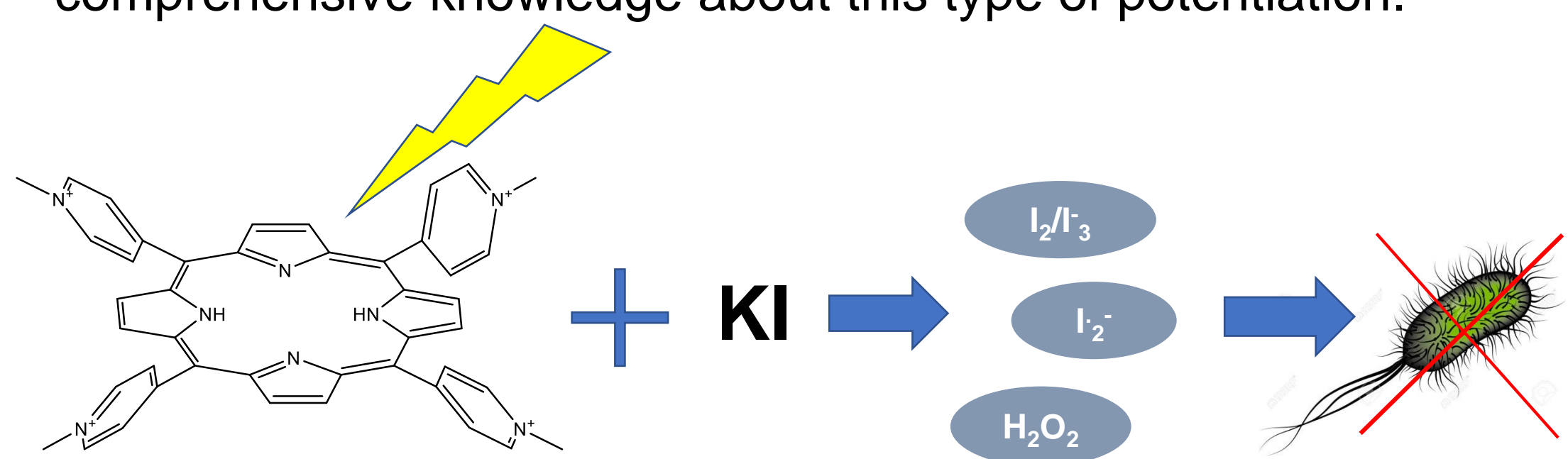


Fig 1. Schematic representation of the combination of PS and KI, leading to the *E. coli* inactivation.

## Materials and Methods

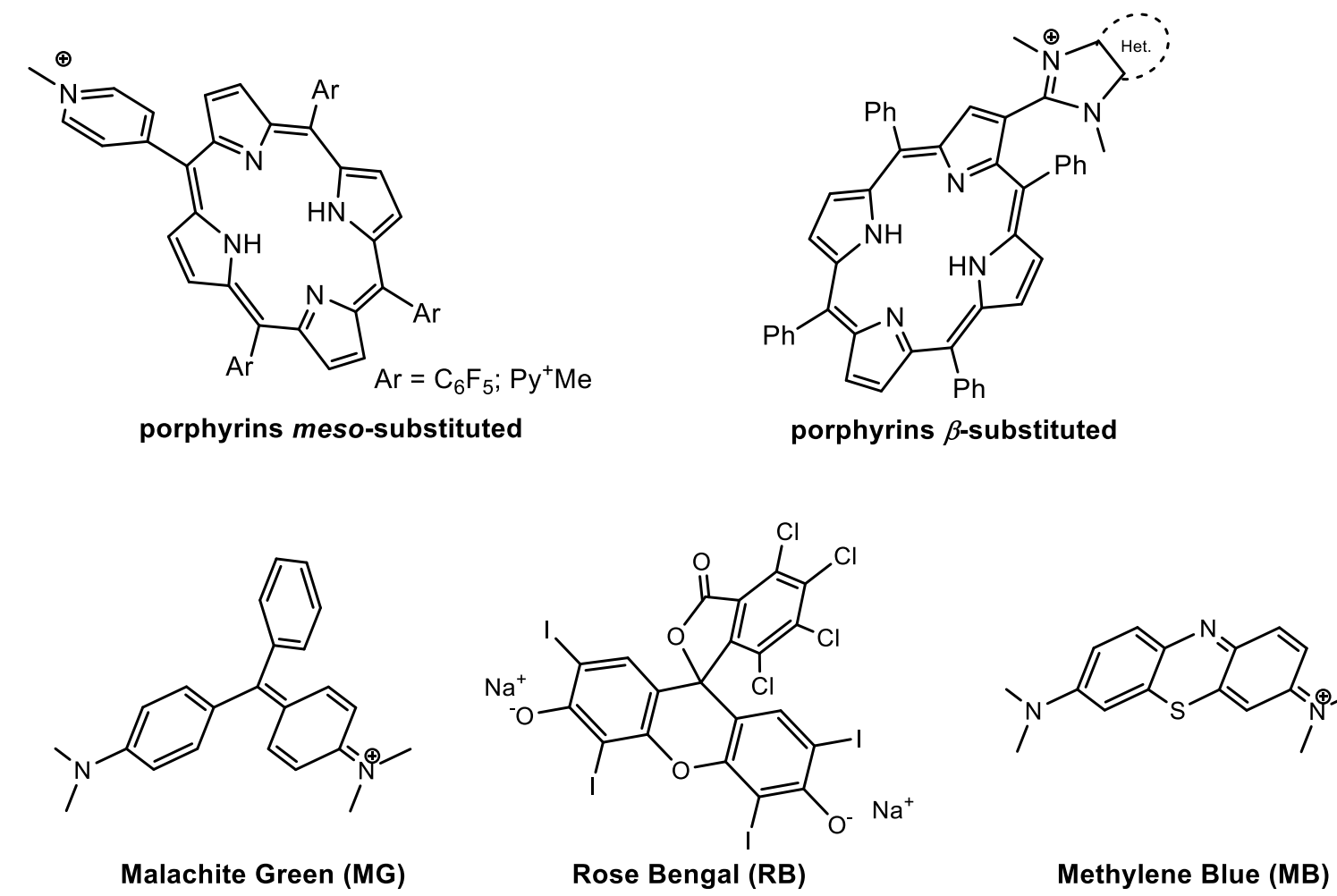
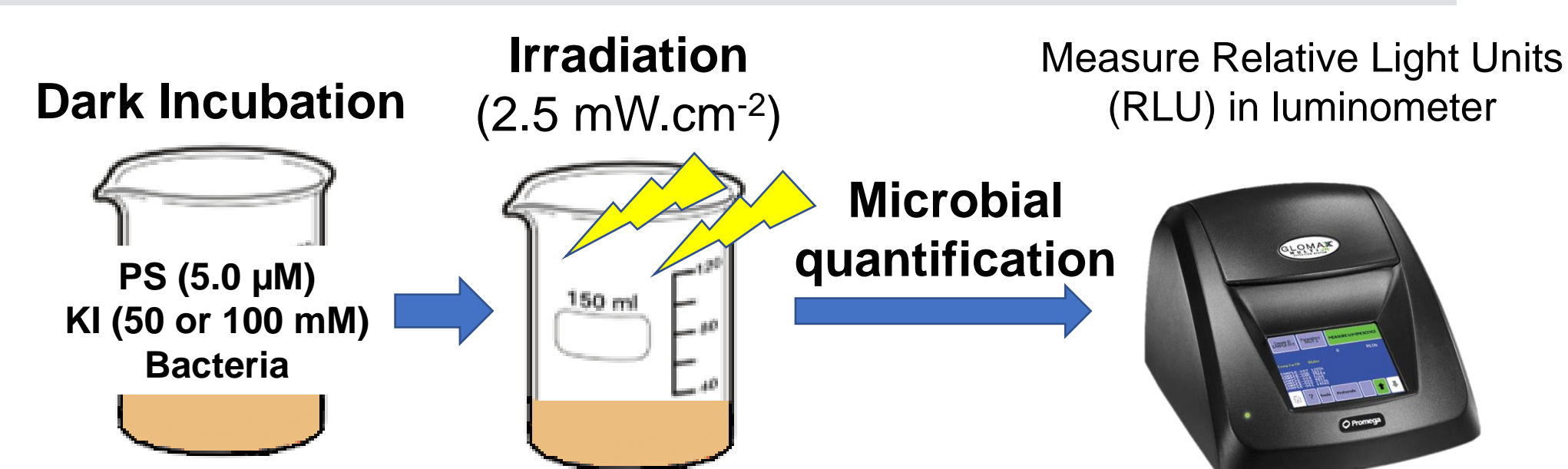


Fig 2. Structures of some PSs used in this study.

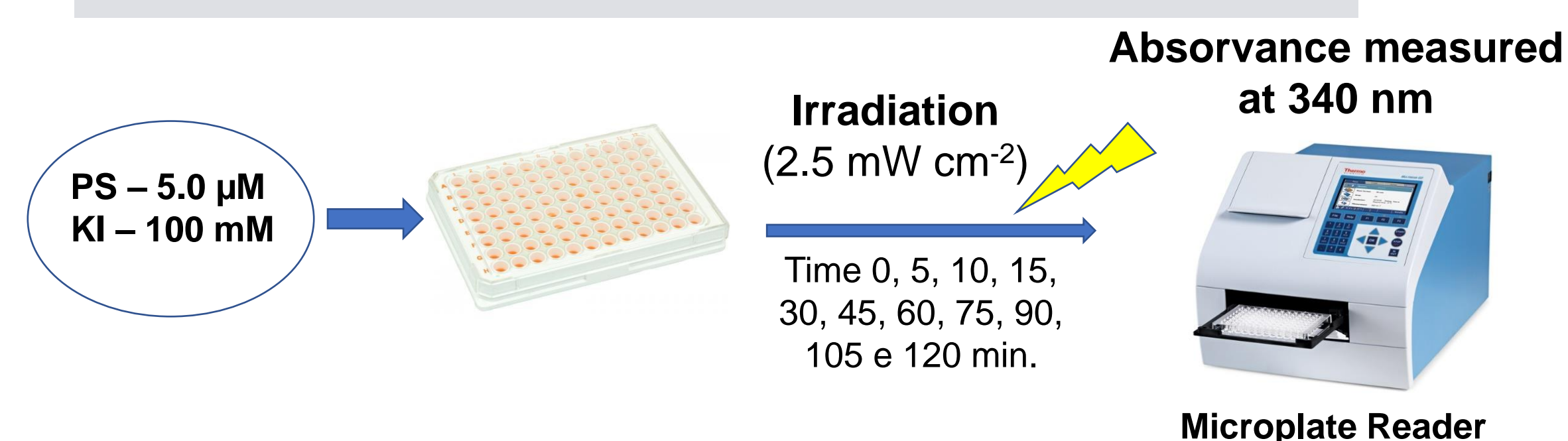


Fig. 3. Bioluminescent *Escherichia coli* strain was selected as a bacterial model

## Photodynamic Inactivation Assays



## Detection of iodine



## Results and Discussion

### Photodynamic Inactivation

The results were summarized according to the inactivation profile observed for each combination of KI and PS in the photoinactivation of bioluminescent *E. coli*.

(a) PS in which their efficiency was potentiated by KI, being observed a gradual decrease in the *E. coli* survival profile:  
**Mono-Py(+)-Me**, **β-ImiPhTPP**, **β-ImiPyTPP**, and **β-BrImiPyTPP**;

(b) PS in which their efficiency was potentiated by KI, being observed an abrupt decrease in the *E. coli* inactivation profile:  
**Tri-Py(+)-Me**, **Tetra-Py(+)-Me**, a formulation based on cationic porphyrins (**Form**), **RB**, and **MB**;

(c) PS in which their efficiency was not potentiated by the addition of KI:  
**Di-Py(+)-Me<sub>opp</sub>**, **Di-Py(+)-Me<sub>adj</sub>**, **Tetra-Py**, **TBO**, **CV**, and **MG**.

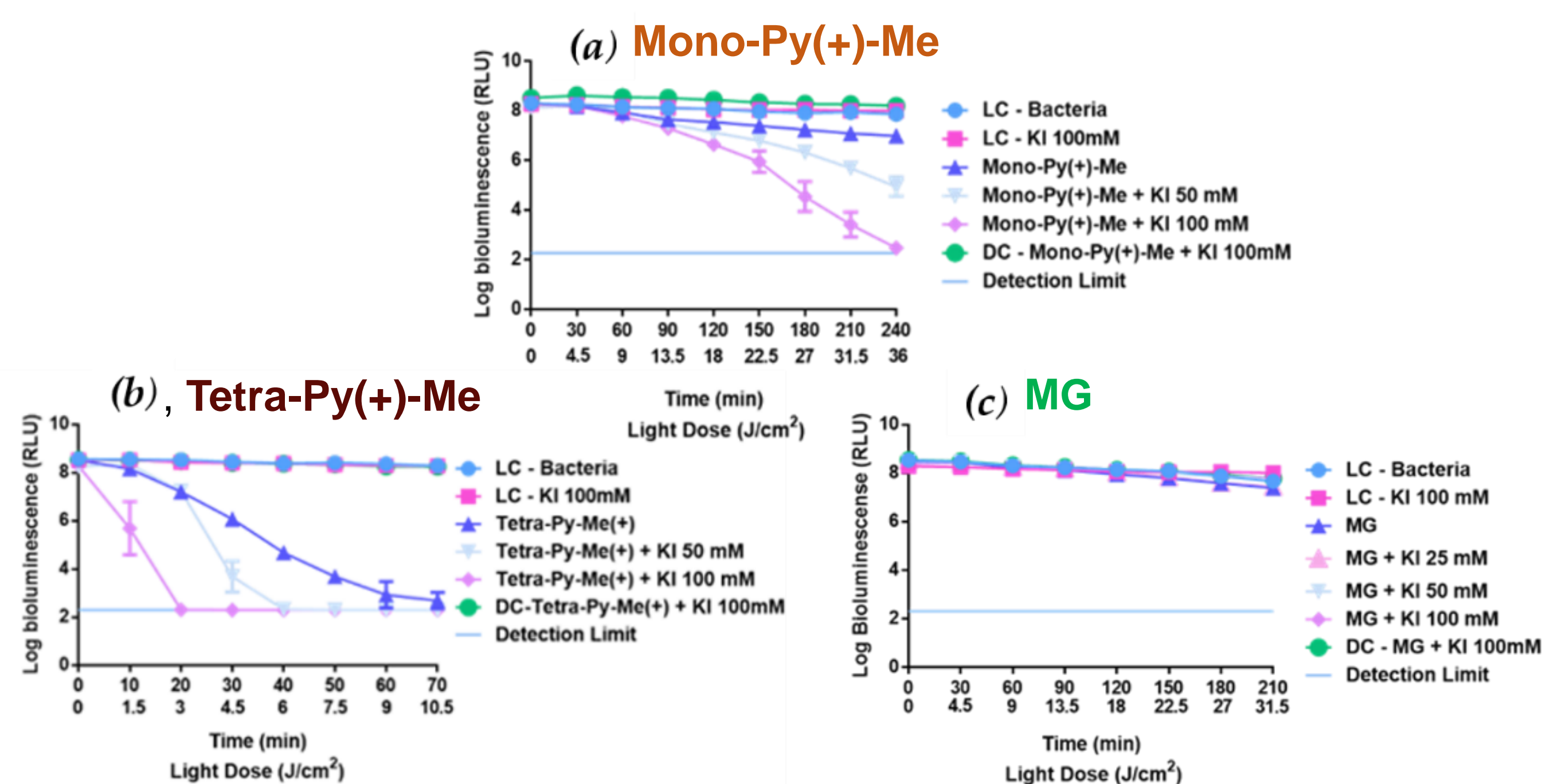


Figure 4. Differential survival profile of *E. coli* during aPDT assays in the presence of **Mono-Py(+)-Me** (a), **Tetra-Py(+)-Me** (b) and **MG** (c) at 5.0 µM, alone or combined with KI. DC - dark control; LC - light control.

### Iodine generation

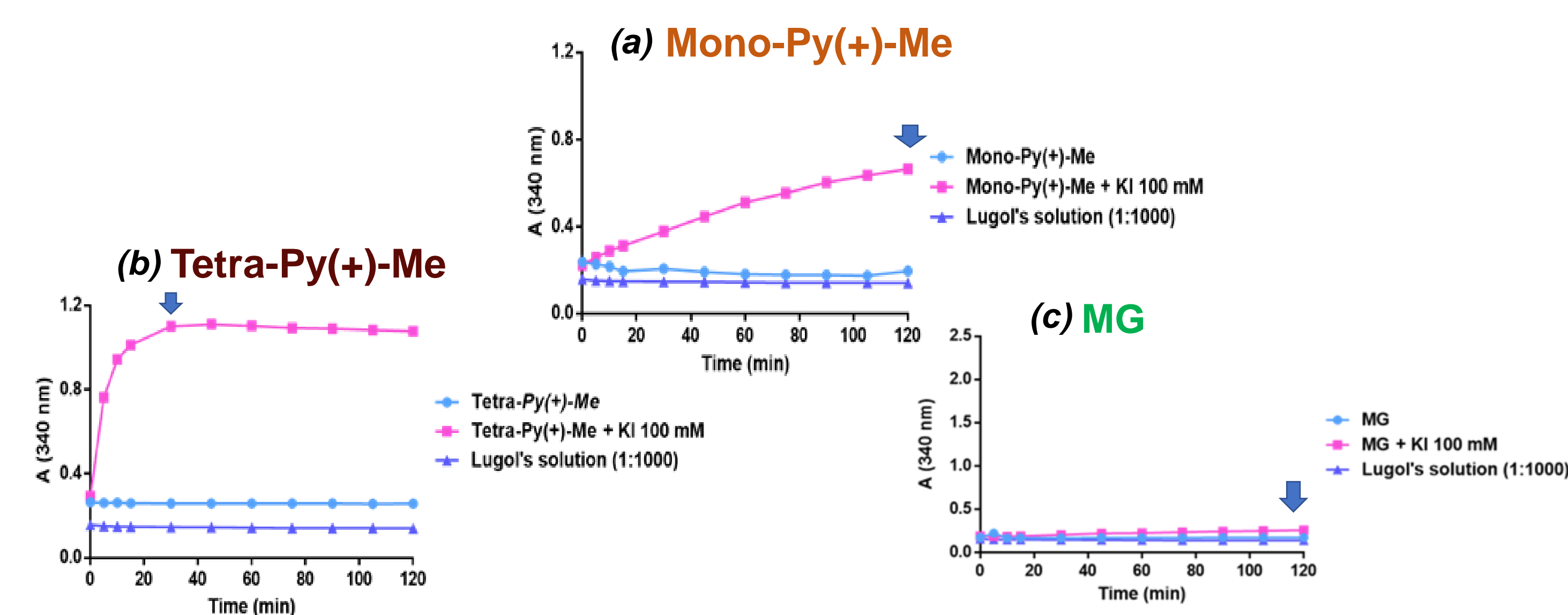


Figure 5. Monitoring of the formation of iodine, at 340 nm, after different irradiation periods in the presence of **Mono-Py(+)-Me** (a), **Tetra-Py(+)-Me** (b) and **MG** (c) at 5.0 µM, either alone or combined with KI at 100 mM. DC - dark control; LC - light control.

## Conclusions

- The application of KI potentiates the aPDT process mediated by some cationic PSs, allowing, for these cases, a drastic reduction of the aPDT treatment time and the PS concentration.
- The PSs that are capable to decompose the peroxyiodide into iodine, are the ones in which aPDT efficiency is improved in the presence of KI.
- Although these studies confirm that the generation of <sup>1</sup>O<sub>2</sub> is an important factor in this process, the PS structure, its aggregation behavior and affinity for the cell membrane are also important features to consider.

## References

Vieira, C.; Gomes, A.T.P.C.; Mesquita, M.Q., Moura, N.M.M.; Neves, M.G.P.M.S.; Faustino, M.A.F.; Almeida, A. *An Insight Into the Potentiation Effect of Potassium Iodide on aPDT Efficacy*. *Front. Microbiol.* 2018, 9, 2665. doi: 10.3389/fmicb.2018.02665

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