Photodynamic therapy (PDT) a good way to fight cancer and replace chemotherapy ?

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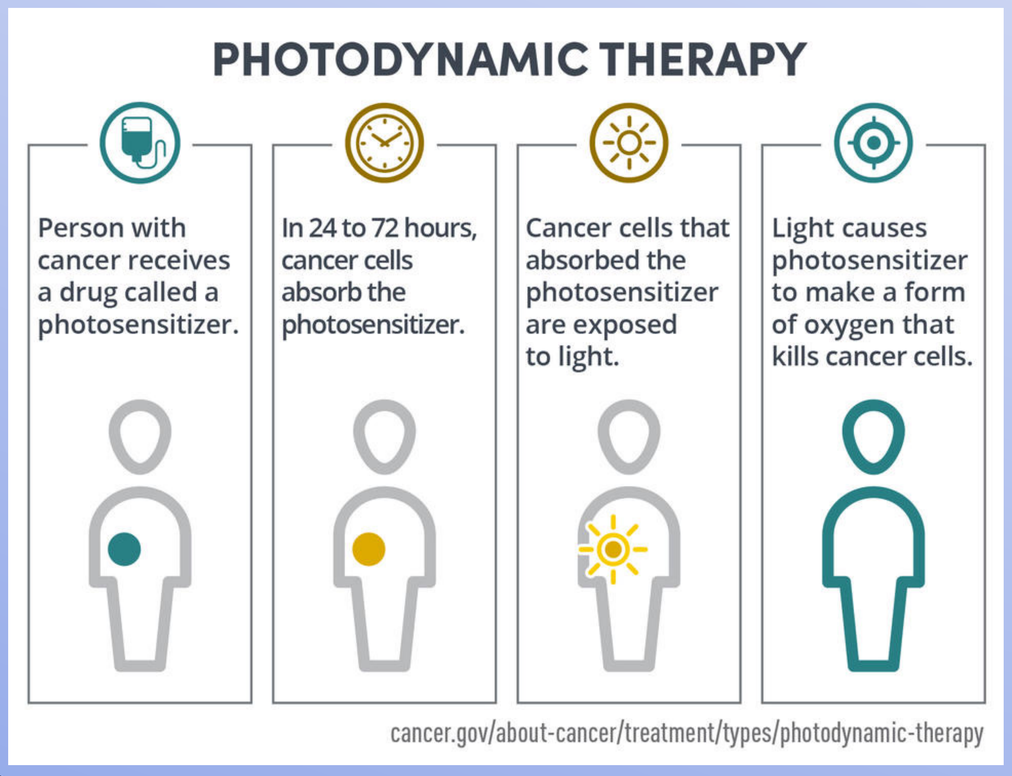
1/ Hallmarks of cancer

Cancer is responsible of more than 10 millions of death by year. That's because cancer cells can, **resist to death by apoptosis, enabling replicative immortality** and **activate invasion by metastasis.**

Chemotherapy remains a **dominant treatment** for cancers. However, **cancer can develop drug resistance** and **become nonresponsive to chemotherapy**, necessitating new alternative, here it's **Photodynamic Therapy (PDT)**.

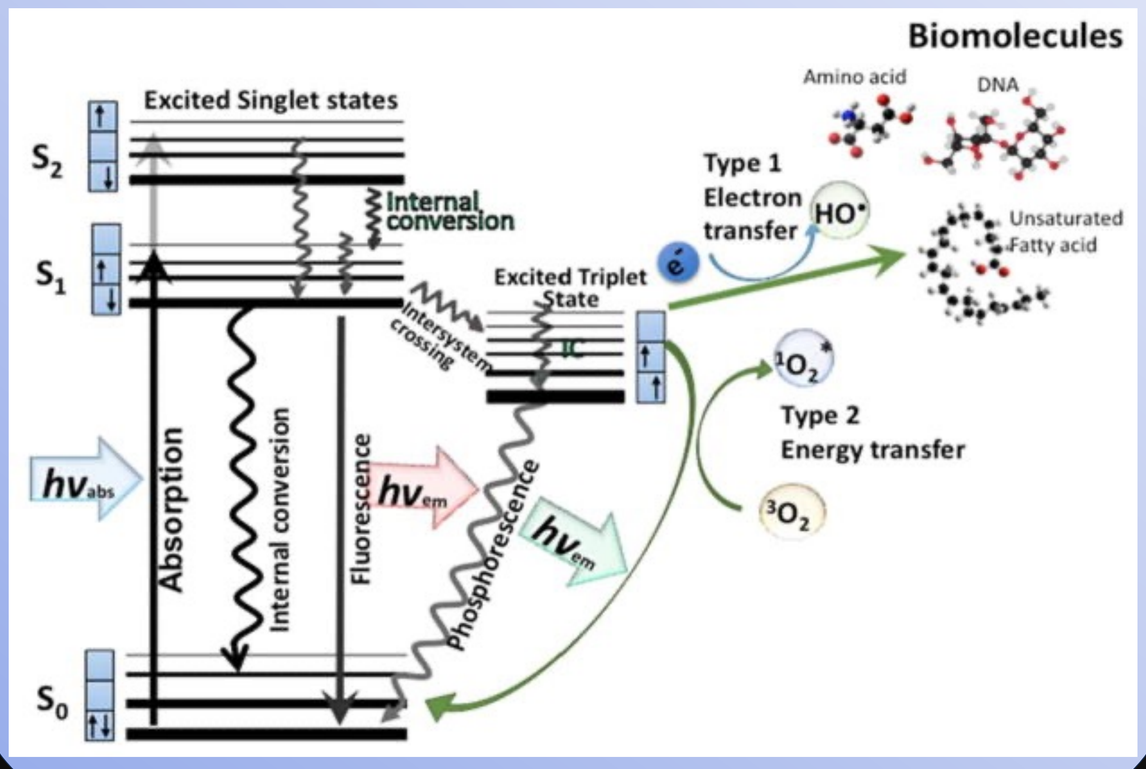
2/ What's Photodynamic Therapy ?



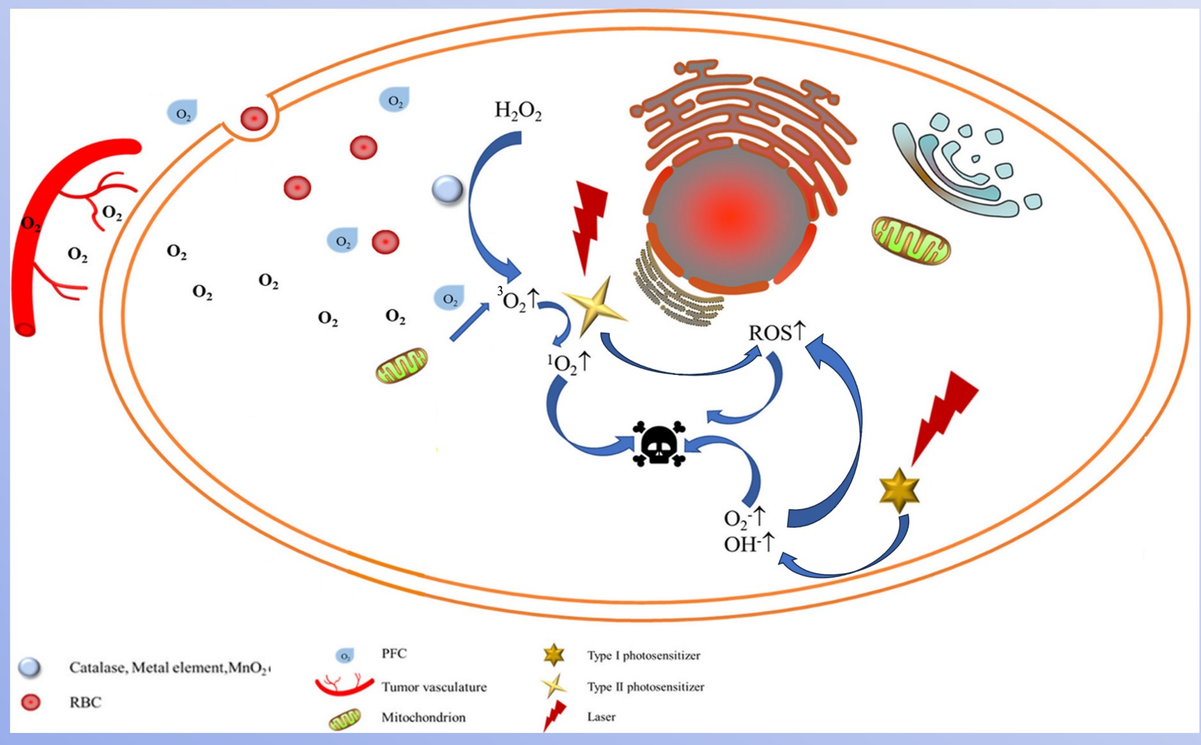
The **photosensitizer (PS)** can be different molecules, but mostly it's the **tetrapyrrole** backbone, it's **like the protoporphyrin prosthetic group** contained in hemoglobin.

It should have a **strong absorption** peak in the **red to near-infrared spectral region (between 650 and 800 nm),** under 800 nm does not provide enough energy to excite oxygen to the singlet state.

3.1/ How does it work from the photonic way ?



3.2/ How does it work from the biological way ?



4/ Some advantages of PDT and perspectives

The Photodynamic therapy have some advantages : **Fewer adverse effects, Little invasiveness with no scar after healing, Short treatment time, Lower costs than other treatments.**

Various novel **PDT approaches have been developed** those years. Preclinical and clinical applications of **PDT have showed promising results**.

Perspective can be the **combination of PDT with other therapeutic** such as chemotherapy, has demonstrated **favorable results**. Various **studies are ongoing** in terms of the efforts to **determine the optimal combination approaches**. Moreover, preclinical interest in **designing PSs for use in PDT will facilitate the development of more capable and advanced agents.**

Bibliography

- Ming, Lan, Kai Cheng, Yu Chen, Rui Yang, et Daozhen Chen. « Enhancement of Tumor Lethality of ROS in Photodynamic Therapy ». *Cancer Medicine* 10, nº 1 (janvier 2021): 257-68. https://doi.org/10.1002/cam4.3592.

- Abrahamse, Heidi, et Michael R. Hamblin. « New Photosensitizers for Photodynamic Therapy ». *Biochemical Journal* 473, nº 4 (15 février 2016): 347-64. https://doi.org/10.1042/BJ20150942.

- Gunaydin, Gurcan, M. Emre Gedik, et Seylan Ayan. « Photodynamic Therapy for the Treatment and Diagnosis of Cancer–A Review of the Current Clinical Status ». *Frontiers in Chemistry* 9 (2 août 2021): 686303. https://doi.org/10.3389/fchem.2021.686303.

- Jiang, Wenqi, Mingkang Liang, Qifang Lei, Guangzhi Li, et Song Wu. « The Current Status of Photodynamic Therapy in Cancer Treatment ». *Cancers* 15, nº 3 (18 janvier 2023): 585. https://doi.org/10.3390/cancers15030585.

- Ostańska, Elżbieta, David Aebisher, et Dorota Bartusik-Aebisher. « The Potential of Photodynamic Therapy in Current Breast Cancer Treatment Methodologies ». *Biomedicine & Pharmacotherapy* 137 (mai 2021): 111302. https://doi.org/10.1016/j.biopha.2021.111302.