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# Porphyrin-coated gold nanoparticles associated with radiotherapy in the treatment of triple-negative breast cancer

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Triple-negative breast cancer (TNBC) is a subtype of breast cancer that accounts for around 20% of all invasive breast cancers and is characterized by resistance to conventional treatments, such as radiotherapy (RT). Photodynamic therapy (PDT) using porphyrins has been described in the literature as a potential therapy against cancer. With advancements in nanomedicine, nanoparticles (NPs) are now being used to deliver the photosensitizer with greater precision and improve the effects of RT. Our goal in this work was to develop an NP coated with porphyrin and combine it with RT in the treatment of TNBC. MDA-MB-231 cells were subjected to PDT using a porphyrin-coated NP and a red light ($660 \pm 11$ nm, 40 $J.cm^{-2}$). Immediately after PDT, the cells were exposed to RT with a dose of 2 Gy. Reactive oxygen species (ROS) and antioxidant defenses were evaluated, as well as cell viability over time for both monolayer and spheroid cultures. Our results showed that the NPs coated with TMPyP had good stability, high absorption in the red region, and reduced levels of thioredoxin reductase. Furthermore, when the therapies were combined, cell survival decreased over time and ROS levels increased. Thus, our results suggest that the combination of PDT using porphyrin-coated gold nanoparticles and radiotherapy has significant potential and could be an effective strategy in the treatment of TNBC.

Keywords: Breast cancer, radiotherapy, bimodal treatment and nanoparticles.

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