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Induction of immunogenic cell death in tumor cells sensitized by curcumin and treated with photodynamic therapy mediated by aluminium-phthalocyanine chloride nanoemulsion

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Abstract

Cancer chemotherapy remains a challenge due to the mechanisms of resistance of tumor cells and the toxicity of anticancer drugs. Processes associated with immunogenic cell death may result in the emission of damage-associated molecular patterns(DAMPs), some are exposed on the plasma membrane, such as heat shock proteins and calreticulin. The curcumin executes mechanisms that can generate immunogenic cell death in cancer cells, because it can generate an increase of intracellular calcium that generates a stress in the endoplasmatic reticulum and possibly in the exposition of calreticulina in the plasma membrane. The photodynamic therapy leads to the generation of reactive oxygen species and can leading to immunogenic cell death. In this context, the justification for this work is that combined anticancer therapy using curcumin and aluminium-phthalocyanine chloride nanoemulsion mediated by TFD can cause intense stress on cancer cells by promoting immunogenic cell death. The results presented in this study showed that: treatments containing curcumin and phthalocyanine nanoemulsion were the more toxic to CT26.WT cells after TFD than free curcumin; in 24 hours the lipid nanoparticles containing curcumin caused greater increase of granularity in CT26.WT cells; in 3 hours free curcumin produces greater accumulation of intracellular calcium than curcumin associated with lipid nanoparticles; in 3 and 24 hours free curcumin is more internalized than curcumin associated with lipid nanoparticles. Future studies to investigate the generation other DAMPs (calreticulin, HMGB1, ATP, HSP70 and 90) to prove that curcumin and phthalocyanine are capable of generating an immune response and are effective against tumors.

Biography:

PhD student in Nanoscience and Nanobiotechnology at the Laboratory of Nanobiotechnology of the University of Brasília. Master in Animal Biology in the area of development and applications of nanostructured materials by the same university. Bachelor in Pharmaceutical Sciences from the same university. It has two scientific initiations in the area of development of polymer nanoparticles carrying anticancer drugs and evaluation of their in vitro activities. Has experience in the field of pharmacy, biology and immunology, development and characterization of nanoparticles for drug loading, in vitro and in vivo evaluation of nanostructures

Speaker Publications:

1. The influence of NLC composition on curcumin loading under a physicochemical perspective and in vitro evaluation; May 2020Colloids and Surfaces A Physicochemical and Engineering Aspects 602:125070; DOI: 10.1016/j.colsurfa.2020.125070
2. Photodynamic therapy mediated by aluminium-phthalocyanine nanoemulsion eliminates primary tumors and pulmonary metastases in a murine 4T1 breast adenocarcinoma model; March 2020Journal of photochemistry and photobiology. B, Biology 204:111808; DOI: 10.1016/j.jphotobiol.2020.111808
3. Oily core/amphiphilic polymer shell nanocapsules change the intracellular fate of doxorubicin in breast cancer cells; May 2019Journal of Materials Chemistry B 7(3); DOI: 10.1039/C9TB00587K

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