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Fundamental Characterization of Oxygen Nanobubbles

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ABSTRACT

A hypoxic environment is created by tumors' incredible growth rate. Hypoxia provides radioresistance to the tumors, thus making radiation treatment less effective. The issue is that increasing the radiation leads to increased side effects in patients. Our goal for the oxygen-filled nanobubble is to deliver oxygen to the tumor to lessen radioresistance and make radiation treatment more efficient. However, we need preliminary research to understand and improve the nanobubbles before further research and implementation. To do this, we synthesized different batches of nanobubbles to optimize the production method and find the best container and temperature to store nanobubbles. We measured the oxygen release profile of the nanobubbles and obtained Transmission Electron Microscope (TEM) images and Dynamic Light Scattering (DLS) data to characterize the nanobubbles. The nanobubbles' peak oxygenation happened 4-5 days after synthesis, and 3 mL SKS glass vials were optimal for storing the nanobubbles. We have not chosen the best synthesis technique or storage temperature yet, due to inadequate TEM images and inconclusive oxygen profile data. We will eventually conduct a proof-of-concept experiment on mice to see if nanobubbles improve irradiation. The optimal storing condition aids our chances for a successful experiment by limiting undesired oxygen release before entering the mouse's body.

KEYWORDS

Nanobubbles, Characterization, Cancer, Radiation, Hypoxia