The Effectiveness of Porous Photothermal Sepiida Ink Nanoparticles for Osteosarcoma Treatment

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Recently, photothermal nanoparticles have become a promising cancer treatment. Nanoparticles found in cephalopod ink, such as cuttlefish and squid ink, are rich in melanin, a highly photothermal conductor. Thus, cephalopod ink nanoparticles are a natural, biocompatible, and cost-effective substitute for synthesized photothermal nanoparticles such as polydopamine nanoparticles, which act as synthetic melanin. The purpose of this project is to optimize the photothermal activity of cephalopod nanoparticles by increasing their porosity for an efficient photothermal cancer treatment. It is hypothesized that porous cephalopod ink nanoparticles would have greater photothermal activity compared to solid cephalopod ink nanoparticles. To test this, a templating procedure was created. Cuttlefish ink, squid ink and dopamine were separately adhered to a mesoporous silica template, which was then etched away with NaOH. UV-vis spectroscopy was used to determine photothermal activity, with the principle that higher absorption correlates with higher photothermal activity. The spectroscopy results indicated that the porous cuttlefish ink nanoparticles and the porous polydopamine nanoparticles had much higher absorptions across all wavelengths, with porous cuttlefish ink nanoparticles having the highest absorption at 1.800 Au. Further characterization with TEM images showed that 30-50 nm porous cuttlefish ink nanoparticles were successfully synthesized. An ANOVA suggested strong statistical significance for the spectroscopy studies. The results of this experiment provide compelling evidence supporting the use of porous cephalopod ink nanoparticles as an efficient photothermal cancer treatment. Cancer cell studies are still being conducted to further confirm this project’s conclusion.

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