

Nanocellulose as a drug delivery system for ITO NPs in the treatment of skin cancer with photothermal therapy

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Crystalline Nanocellulose (CNC) has garnered significant interest within the scientific community due to its distinct properties. High availability, nanoscopic dimensions, biocompatibility and ease of functionalization, render nanocellulose a suitable candidate for use as a substrate in drug delivery systems (DDS). The present study explores this potential by incorporating carboxyl groups onto the nanocellulose, which serve as anchor points for the attachment of Indium Tin Oxide (ITO) nanoparticles. These nanoparticles were selected for their peculiar absorption peak in the near-infrared (NIR) spectrum, specifically within the range of 1700-1800 nm, where human tissues show the highest transparency.

The goal of this research project is to establish a selective transport system that targets ITO nanoparticles to cancer cells to facilitate the treatment of skin cancer via photothermal therapy. To enhance the selectivity of the DDS, the nanocellulose was functionalized with a molecular selector composed of glucose and a short pegylated chain, designed to interact with GLUT1 channels, known to be overexpressed in cancer cells. Preliminary biological evaluations shown that the DDS possesses a much higher internalization efficiency than that observed for ITO nanoparticles administered independently. Moving forward, the subsequent phase of the research entails conducting hyperthermia studies on cells treated with the DDS in conjunction with NIR irradiation.