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Nanocellulose: a versatile platform for drug delivery

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Nanocellulose is a versatile biopolymer with excellent chemical and physical properties: high mechanical strength, low density, biodegradability, and biocompatibility. It can be extracted from waste materials such as agricultural biomass or from other sources including plants, bacteria, and algae.[1] Subsequent chemical functionalization increases the properties of nanocellulose and its applicability in medicine, including *drug delivery*. Taking advantage of the modifiable surface of the nanocellulose, carboxyl functions were introduced and used as ligands to anchor Indium Tin Oxide Nanoparticles (ITO NPs). These nanoparticles have an absorption peak in the NIR around 1700-1800 nm, which has recently been exploited to generate heat upon IR irradiation,[2] and is thus promising for photothermal therapy of tumors in the third biologically transparent window. Rose Bengal is another molecule selected for nanocellulose-mediated drug delivery. Rose Bengal has long been used in clinic, but only recently has shown to be effective in photodynamic therapy. Rose Bengal irradiated at 532 nm releases reactive oxygen species (ROS) with distinct antifungal properties.[3] Therefore, an effective synthesis was developed to bind Rose Bengal to nanocellulose and achieve effective antifungal results for the treatment of nail onychomycosis with a lower drug concentration.

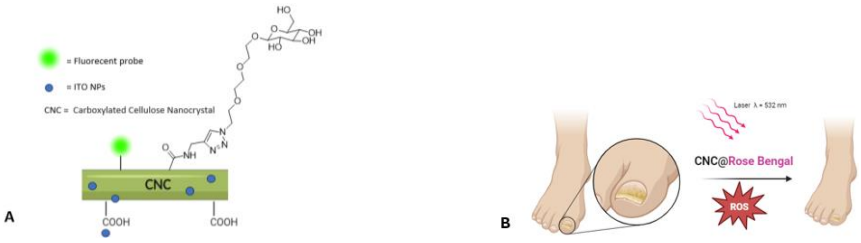

Figure 1: **A**. Drug delivery system nanocellulose based for ITO NPs selective transport. **B**. Treatment of onychomycosis with nanocellulose decorated with Rose Bengal

References:

[1] N. Lin, A. Dufresne, European Polymer Journal, 2014, 59, 302-325.
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[3] J. Houang, C. Halliday, S. Chen, C.H. Ho, A. Bekmukhametova, A. Lauto. Journal of Biophotonics, 2021, 14.
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