ORAL COMMUNICATIONS

TWEEN 60-COATED COPPER NANOPARTICLES FOR BIOMEDICAL APPLICATION: CHARACTERIZATION AND IN VITRO EVALUATION

S. Mariano[1|2], S.C. Resta[3], G.C. Carbone[1|2], A. Talà[3], D. Manno[1|2], A. Serra[1|2], G. Quarta[1|2], E. Panzarini[3], L. Calcagnile[1|2]

[1]Department of Mathematics and Physics, University of Salento, Lecce, Italy; [2]CEDAD (Center of Applied Physics, Datation and Diagnostics), Department of Mathematics and Physics, University of Salento, Lecce, Italy; [3]Department of Biological and Environmental Sciences and Technologies (Di.S.Te.B.A.), University of Salento, Lecce, Italy

The use of copper nanoparticles (CuNPs) in biomedicine has gained significant importance due to their unique physico-chemical properties, high surface-to-volume ratio, and cost--effectiveness compared to noble metals like gold or silver. The main applications in the biomedical field include wound healing and tissue engineering, cancer theranostics and antimicrobial activity. Despite their promise, the primary hurdle for CuNPs is biocompatibility, and their biomedical use requires stabilization via biocompatible surfactants to prevent aggregation, control ion release, and limit cytotoxicity. Among CuNPs potentiality, their strong antibacterial activity and reduced possibility of inducing resistance is particularly interesting as bacterial infections remain a major public health concern, increasingly driven by the spread of antibiotic-resistant strains.

In this study, we developed and characterized Tween 60--coated CuNPs as a promising component in patches for wound healing. CuNPs were synthetized and characterized using UV-Vis spectrophotometry and high-resolution transmission electron microscopy (Holo-TEM), revealing a spherical morphology with a diameter of 5-10 nm. Given the use for skin application, we evaluate their interaction with human keratinocytes HaCaT cells and their anti-bacterial efficacy. A good stability in culture media of the used biological systems characterize the CuNPs. Cytotoxicity assays and TEM analysis of HaCaT cells, along with antibacterial activity investigated in vitro against Escherichia coli and Staphylococcus aureus, by determining the minimum inhibitory concentration, morphological alterations and potential bacterial internalization by TEM analysis, demonstrated the high value of Tween 60-coated CuNPs supporting their potential use in skin-targeted therapies and CuNP-based patches.

Acknowledgments: This work was supported by the prp@ceric PNRR Project.