FUNCTIONAL METAL NANOPARTICLES AND THEIR COMPOSITES FOR ANTIMICROBIAL APPLICATION

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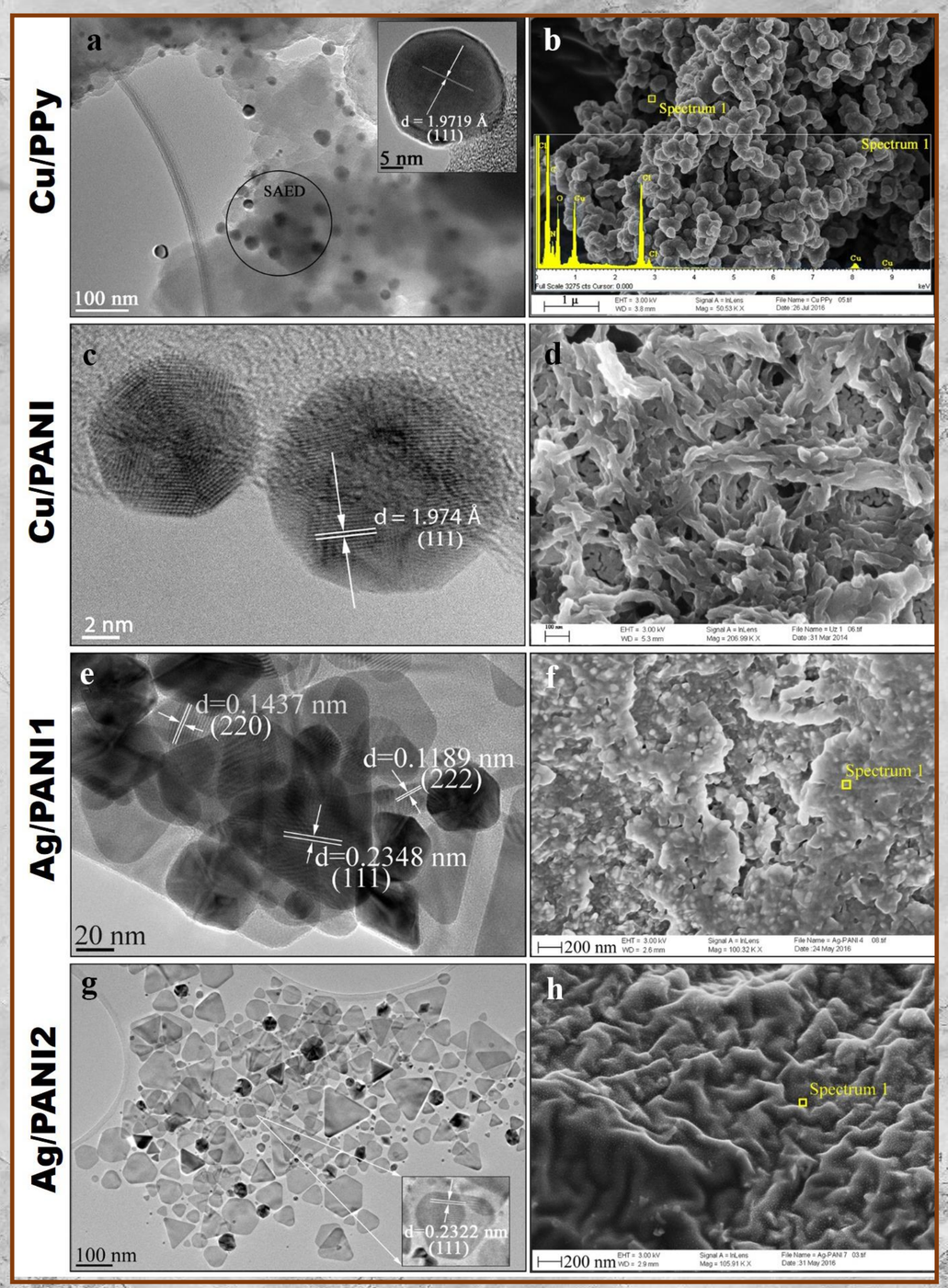

Fig. 1 TEM and FESEM images of MetNPs/polymer nanocomposites

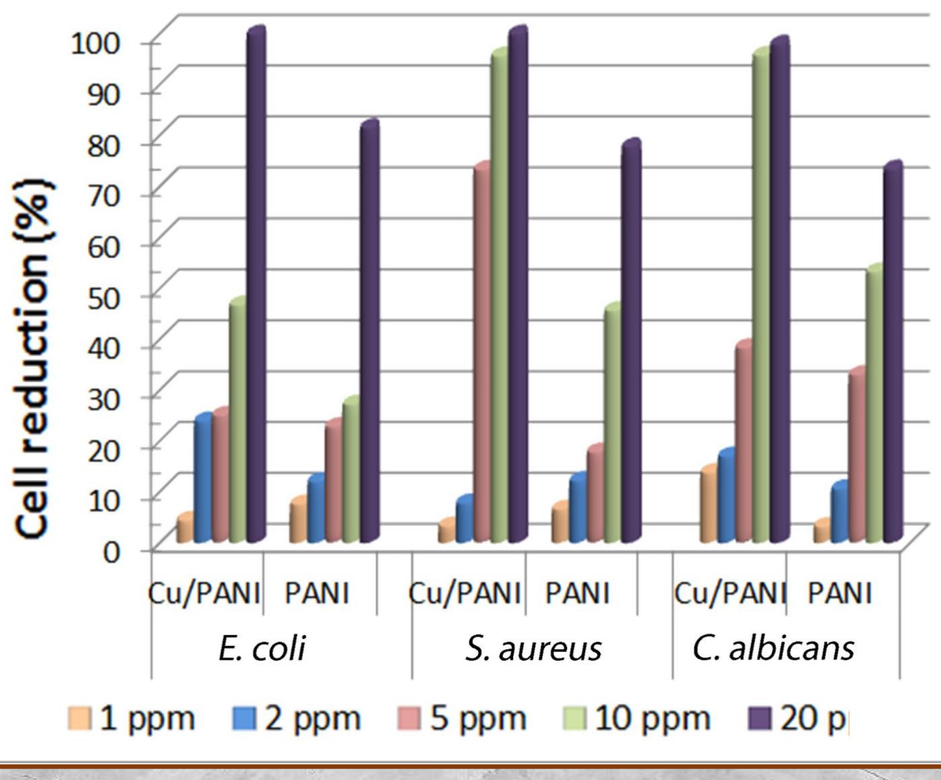

Fig. 2 Concentration-dependent reduction ability of the Cu-PANI and PANI on E. coli, S. aureus and C. albicans, over 1 h incubation time

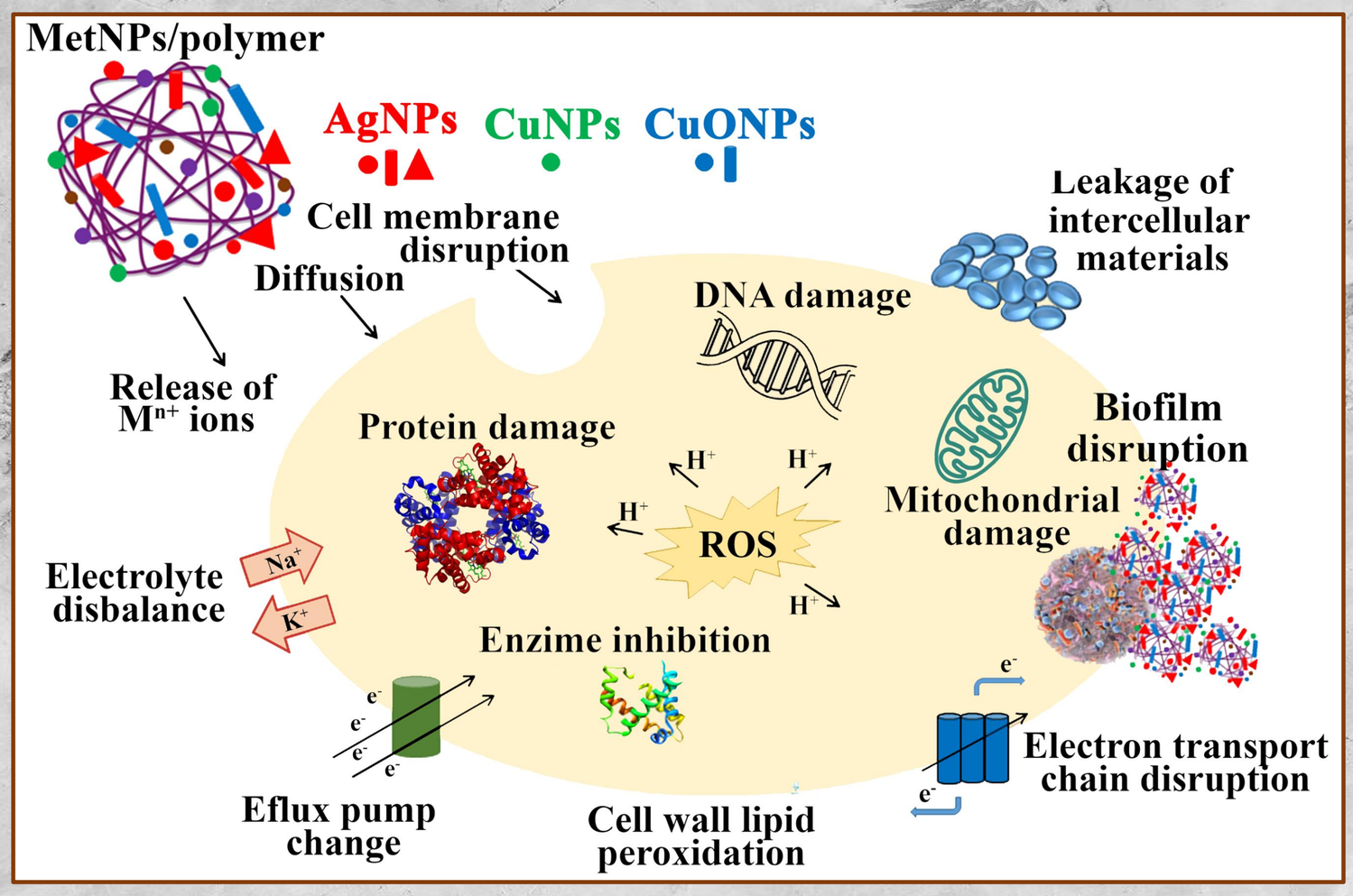

Fig. 3.Schematic representation of the interaction of MetNPs/polymer with the microbe and its different types of damages

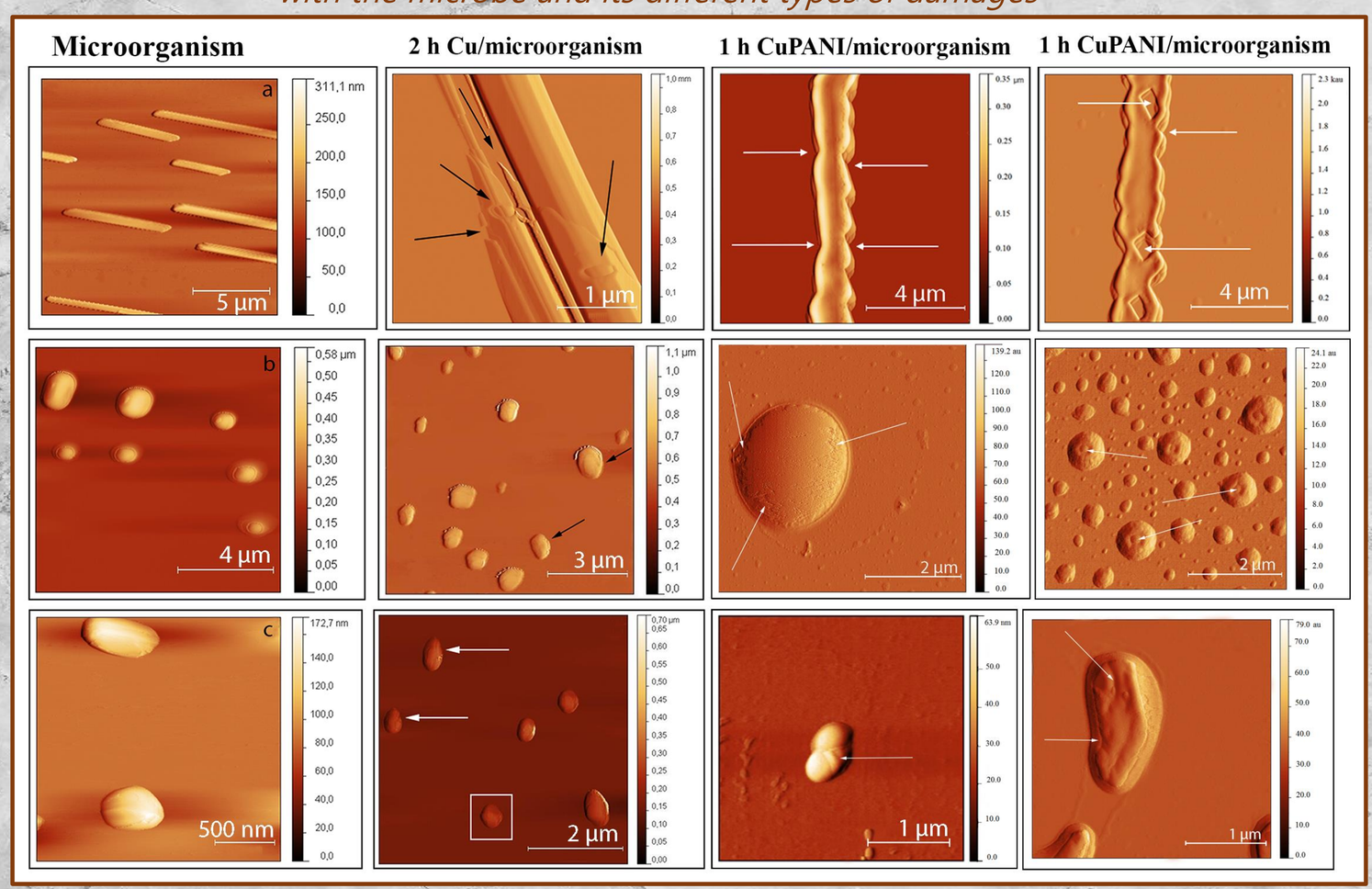

***Fig. 4** AFM images of untreated and treated E. coli (row a) S. aureus (row b) and C. albicans (row c) cells*

With pronounced optical absorption and scattering, metal nanoparticles (MetNPs), gold (Au), silver (Ag), and copper (Cu) have dug their own way into a wide spectrum of applications, from biological to electrochemical. The effects that are the most important characteristics of these particles - localized surface plasmon resonance (SPR) and high surface reactivity, are closely related to their physico-chemical features (size, shape, high percentage of unsaturated surface atoms, surface charge, medium, etc.), allowed researches to design nanostructures tailored for specific biomedical applications based on a variety of biological processes occurring at the nanometer scale. CuNPs, and AgNPs with different sizes and shapes, as free-standing or functionalized (by polymers – polyaniline and polypyrrole) NPs, having an interesting and satisfying antimicrobial activity as one of their many applications in biological systems. Besides NPs' incorporation into polymers protects them from agglomeration/oxidation, their functionalization improves their properties, among others, their antimicrobial activity. However, additional attention should be paid to their cytotoxicity, environmental impact, long-term stability, as well as potential microbial resistance development.