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The membrane depolarization and increase intracellular calcium level produced by silver nanoclusters are responsible for bacterial death

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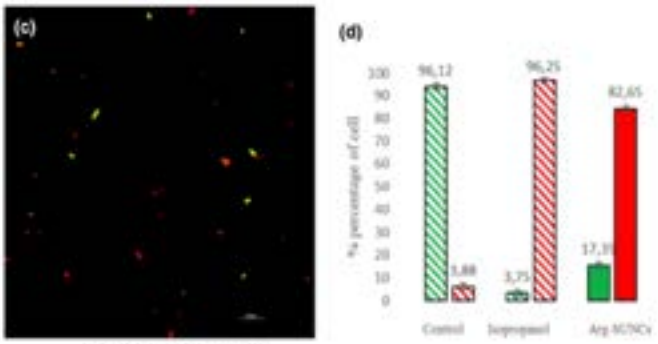
This work highlights how our silver ultra nanoclusters (ARGIRIUM-SUNc) hand-made synthesized, are very useful as a bactericide and anti-biofilm agent. The Argirium-SUNc effective antibacterial concentrations are very low (< 1 ppm) as compared to the corresponding values reported in the literature. Different bacterial defense mechanisms are observed dependent on ARGIRIUM-SUNc concentrations. Biochemical investigations (volatilome) have been performed to understand the pathways involved in cell death. By using fluorescence techniques and cell viability measurements we show, for the first time, that membrane depolarization and calcium intracellular level are both primary events in bacteria death. The ARGIRIUM-SUNc determined eradication of different biofilm at a concentration as low as 0.6 ppm. This suggests that the effect of the nanoparticles follows a common mechanism in different bacteria. It is highly probable that the chemical constitution of the crosslinks could be a key target in the disrupting mechanism of our nanoparticles. Since the biofilms and their constituents are essential for bacterial survival in contact with humans, the silver nanoparticles represent a logical target for new antibacterial treatments.



Arg-SUNCs 5 ppm

Recent Publications

1. Molina-Hernandez J.B at al. The membrane depolarization and increase intracellular calcium level produced by silver nanoclusters are responsible for bacterial death. Scientific Reports Open AccessVolume 11, Issue 1December 2021 Article number 21557

2. Structure and properties of electrochemically synthesized silver nanoparticles in aqueous solution by high-resolution techniques Gasbarri C. at al. Molecules Volume 26, Issue 171 September 2021 Article number 5155
3. Antimicrobial and Antibiofilm Activities of New Synthesized Silver Ultra-NanoClusters (SUNCs) Against Helicobacter pylori Grande R. Frontiers in Microbiology Open AccessVolume 1131 July 2020 Article number 1705
4. Simple Determination of Silver Nanoparticles Concentration as Ag+ by Using ISE as Potential Alternative to ICP Optical Emission Spectrometry. ChemistrySelect Volume 4, Issue 32, Pages 9501 - 950429 August 2019
5. Electrochemically synthesized silver nanoparticles are active against planktonic and biofilm cells of Pseudomonas aeruginosa and other cystic fibrosis-associated bacterial pathogens. Frontiers in Microbiology Open AccessVolume 9, Issue JUL5 July 2018 Article number 1349

Biography

Luca Scotti has completed his PhD from University of Chieti-Pescara, Italy and BSc. Chemistry at University of Milano, Italy. He is the Professor of Biochemistry at department of Medical, Oral and biotechnology (DISMOB), Italy. He has over 30 publications that have been cited over 300 times, and his publication h-index is 11. He has been serving as an editorial board member and topics member of several reputed journals.

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