



Antibacterial Effects of Protein Corona Capped Copper Sulfide Nanoparticles

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Significance

As a potential way to attack a rising health concern, antibiotic resistance, biosynthesized CuS nanoparticles, offers a great advantage due to the increase of particle biocompatibility and high antibacterial activity. Moreover, bacteria is used as the main approach since its cost-effectivity and fast-growing rates, increases production.

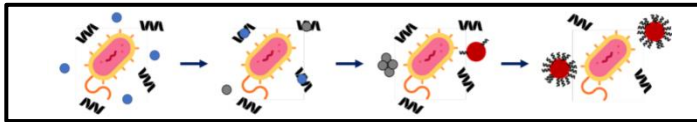


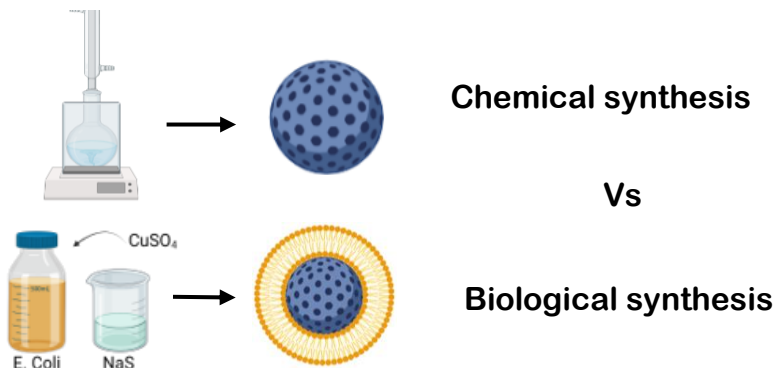
Fig 1. Extracellular interaction with salts



Fig 2. Intracellular interaction with salts

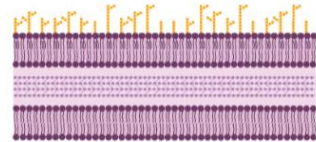
Innovation

This novel biological synthesis will minimize toxic by-products and high energy waste usually made by traditional chemical synthesis. Also, this innovative method has the potential to increase antibacterial effects of copper sulfide nanoparticles.

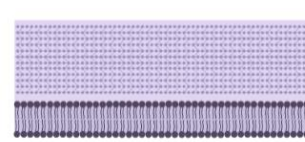


Hypothesis

Gram negative membrane



Gram positive membrane

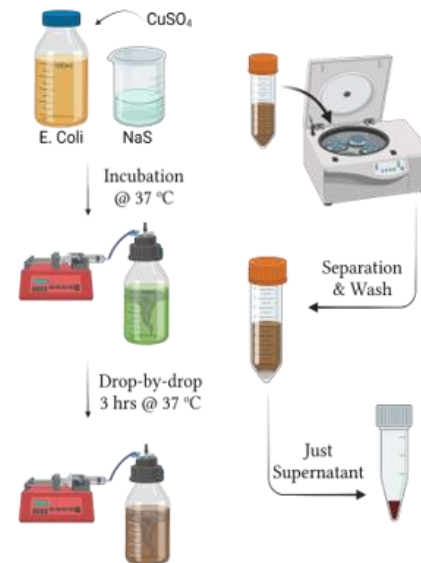


If copper sulfide nanoparticles are biologically synthesized by gram negative or positive bacteria, then protein-salts interactions will develop a highly stabilized particle with a Protein Corona on its surface; increasing biocompatibility, antibacterial activity, and lowering particle toxicity.

Methodology

Synthesis

Purification



Results

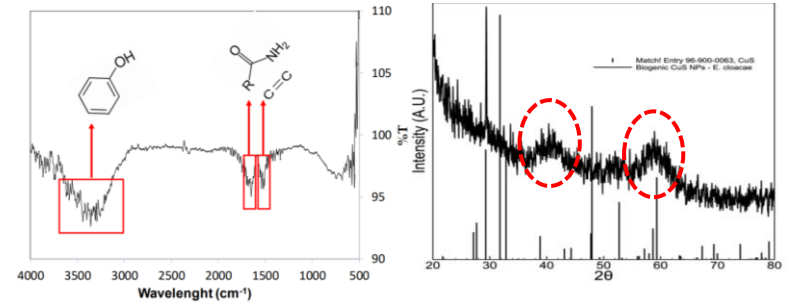


Fig 3. FTIR

Fig 4. XRD

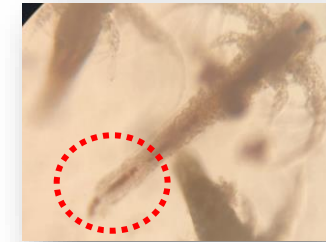


Fig 5. *Artemia Salina*

Conclusions and Future Work

- Important protein organic compounds were found in the nanoparticle's surface suggesting a Protein Corona.
- Novel copper sulfide biogenic synthesis was successfully accomplished as shown in the XRD.
- As shown in **Fig. 5**, biosynthesized NPs are ingested by *Artemia Salina* and accumulated in its digestive tract.
- *Artemia Salina* showed no resistance to high NP concentrations (1500 ppm).
- 2D electrophoresis will be done for further protein characterization.