

## Green synthesis of protein-decorated selenium nanoparticles for enhanced antibacterial and degradation of organic dyes in water.

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### Introduction

- Bacteria and toxicants continue to threaten our health and pollute our environment urging the innovation of solutions to mitigate their prevalence and effect on human health and ecosystem integrity.
- Synthesizing **selenium nanoparticles** and incorporating them into solid supports is a milestone toward better health and hygiene due to their antimicrobial and catalytic properties.
- In this project, we have synthesized **bovine serum albumin (BSA) capped silver nanoparticles** using ascorbic acid and polymer-supported beads.
- The materials exhibited **good antibacterial and catalytic properties**.

### Method

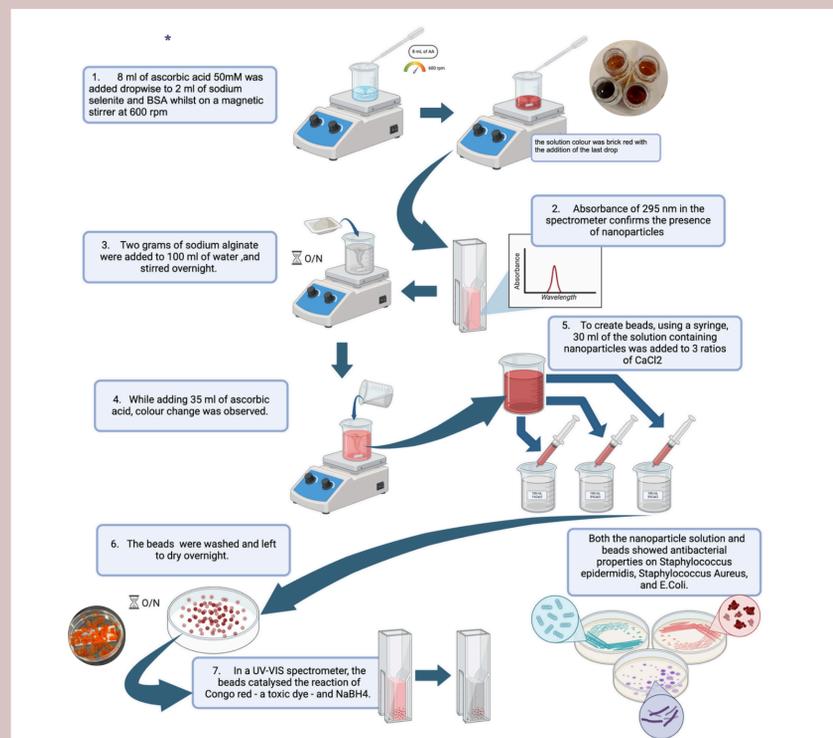


Figure 1:

- Preparation method of SeNPs solution and formation of beads

\*Lemon juice was used as an alternative for ascorbic acid. Both are reducing agents aiding in the creation of Se NPs

### Results

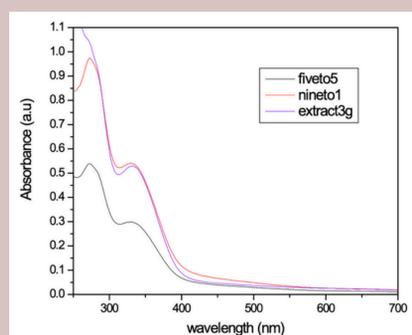


Figure 2

- Selenium nanoparticles presence was confirmed via UV-Vis spectrometry.

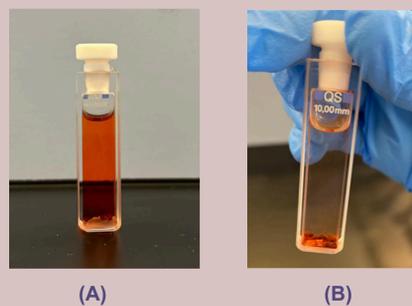


Figure 3

- Beads incorporated with Selenium Nanoparticles effectively degraded the Congo Red, which is an environmentally toxic dye.
- (A): before adding the beads
- (B): After adding the beads

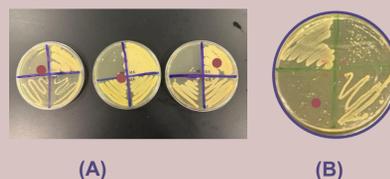


Figure 4

- (A): SeNP solutions prepared using lemon juice were effective against staphylococcus epidermidis, staphylococcus aureus, and E.coli
- (B): SeNP solutions prepared using Ascorbic Acid were effective against staphylococcus epidermidis

### Conclusion

#### 1. Selenium nanoparticles were effective:

- At getting rid of toxic materials "congo red".
- Against bacterial growth.

#### 2. Promising ideas:

- The likelihood of creation of novel antibiotics.
- Decontamination of hospital wastewater.

#### 3. Future plan:

- Focusing on testing the efficacy of those nanoparticles in killing the cancerous cells.

### References

- Abdelhamid AE, Ahmed EH, Awad HM, Ayoub MM. Synthesis and cytotoxic activities of selenium nanoparticles incorporated nano-chitosan. Polymer Bulletin. 2024;81(2):1421-37.
- Alhawiti AS. Citric acid-mediated green synthesis of selenium nanoparticles: antioxidant, antimicrobial, and anticoagulant potential applications. Biomass Conversion and Biorefinery. 2024;14(5):6581-90.
- Illustrations were made using biorender